A social psychological perspective on health behaviour: Social support, need satisfaction and their impacts on physical exercise and self-regulation

Thesis

presented to the Faculty of Arts

of

the University of Zurich

for the degree of Doctor of Philosophy

by

Pamela Rackow

of Germany

Accepted in the spring semester 2013 on the recommendation of

Prof. Dr. Rainer Hornung

Prof. Dr. Veronika Brandstätter-Morawietz

Prof. Dr. Urte Scholz

(Zurich, 2013)

I would like to dedicate this thesis to
Eike von Lindern.

For his love and true friendship.

Abstract

Being physically active and exercising is associated with better health (e.g., WHO, 2010). Individuals who engage in physical exercise have a lower risk of mortality (Paffenbarger et al., 1993) and an enhanced sense of general well-being (e.g., Schwarzer, 2004). To that end, several health organisations have established guidelines with recommendations for health-improving physical activity participation (e.g., CDC [Centers for Disease Control and Prevention], 2012; WHO [World Health Organization], 2012). Nevertheless, a large number of Swiss inhabitants do not abide by these recommendations (Lieberherr, Marquis, Storni, & Wiedenmayer, 2010). Therefore, the investigation and identification of psychological determinants associated with health-related physical activity participation is still of extraordinary importance.

The psychological determinants of physical activity participation can be distinguished between, for example, self-regulation abilities (e.g., Gollwitzer & Sheeran, 2006) and determinants of the individuals' social context, such as support (e.g., Uchino, 2009) or the satisfaction of basic psychological needs (Deci & Ryan, 2000; Markland & Tobin, 2010). Above all, this dissertation is comprised of the investigation of psychological determinants of an individual's social context with regard to physical exercise.

Although social support and need satisfaction are well-established determinants for physical activity engagement, there are still several open questions and research gaps that need to be addressed. With regard to social support, it has most often been examined in studies applying correlational designs. Moreover, social support has not yet been embedded in a comprehensive model of health behaviour change, although prior research suggests that social support is an important determinant for health behaviour and health behaviour change (e.g., Uchino, Uno, & Holt-Lunstad, 1999) and recent findings indicate associations between

social support and physical activity (e.g., Trost, Owen, Bauman, Sallis, & Brown, 2002), self-efficacy (e.g., McAuley, et al., 2003) and different forms of self-regulation (e.g., Anderson, Wojcik, Winett, & Williams, 2006). A further important issue to address is the investigation of the different kinds of social support. One distinction can be made between perceived and received social support. Perceived social support is defined as the perception of potential help from an individual's social network (Uchino, 2009; Schwarzer & Knoll, 2007). Compared to perceived social support, *received* social support has been less studied, although it comprises the actual and concrete support transactions (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007) that are particularly important for health behaviour change. With regard to need satisfaction, there has not been a German scale specific to assess exercise thus far, although need satisfaction constitutes an important condition for intrinsic motivation in health behaviour change (in this case exercising).

To address the open questions and research gaps, two studies were conducted t. The aim of *Study 1* was to test the impact of received social support on physical exercising, as well as on volitional mediators (self-efficacy, action control and action planning) of the health action process approach (HAPA; Schwarzer, 2008). It includes an intervention group and control-group design with ten measurement time points. We recruited participants who wanted to enhance their exercising. The task for the intervention group was to exercise with a *new* exercise companion for the duration of the study. In so doing, it was thought that the instrumental and emotional social support received by the respondent would be addressed and utilized to enhance and maintain his/her physical exercise. Finding a new exercise companion should ensure that each participant in the intervention group had the same starting conditions. *Study 2* was designed as a validation study to assess the validity and reliability of the newly constructed "German Psychological Need Satisfaction in Exercise Scale" (PNSEG), a scale to measure basic psychological need satisfaction in exercise contexts.

Study 2 comprised two measurement time points (T1, the starting time point and T2, nine months later) and participants were recruited in different sport and exercise facilities.

With regard to *Study 1*, both the intervention group and the control group were able to improve their physical exercising during the study period. This was an unexpected result because it was assumed that only the intervention group would experience enhanced physical exercising. Moreover, in order to embed received social support in the HAPA, several path analyses were conducted. Our results indicated that, for the intervention group, the effect of received emotional social support on physical exercise was present for all volitional constructs of the HAPA. However, these effects could not be demonstrated for received instrumental social support or for the control group.

The results of *Study 2* support several psychometric properties of the newly developed PNSEG: The factorial composition was tested with two randomly split samples at T1, and the reproducibility of the factor structure was demonstrated at T2. Furthermore, the results showed good internal consistency and satisfying indicators of construct and criterion validity.

Overall, the results of Study 1 indicate that in the intervention group, in particular, received emotional social support promotes physical exercising via the volitional mediators of the HAPA. Therefore, embedding received social support in the HAPA was partly successful.

Additionally, with the newly developed PNSEG (Study 2), a reliable and valid scale to assess need satisfaction in exercise is now available for countries where German is the official language. This offers the possibility to simultaneously study exercise-specific received social support and basic need satisfaction in exercise.

Acknowledgments

This dissertation could not have been completed without the help of many people, who supported me during the last four years.

My special thank and appreciation go to Prof. Rainer Hornung, who was always willing to share thoughts and ideas with me and who gave me the freedom I needed for the whole project and especially for this dissertation. I am especially grateful for his valuable overall support and securing funding. I would also like to thank Prof. Dr. Veronika Brandstätter-Morawietz, my second supervisor, for accepting to serve as a reviewer for this dissertation. I am further deeply grateful and very happy that Prof. Dr. Urte Scholz agreed to be the third supervisor of this thesis. In every stage of my dissertation project, she spent her time and energy in supporting me and giving advice for the whole project. Thank you very much! Furthermore, huge thanks for their support and encouraging comments go to my current and former colleagues at work: Melanie Braun, Daniel Hausmann, Susanne Inglin, and Sibylle Ochsner. I wish to express my special appreciation to Theda Radtke for her great emotional and practical support, and her friendship during the last four years. Without the help and the dedication of my students, data collection and data processing had never been finished. Thanks to Angela Bearth, Cem Baykal, Heidi Bodenmann, Stefanie Kopp, Bettina Strauss, Monika Sutter and many more. Of course, there are many other people who directly and indirectly contributed to the success of this dissertation – thanks to all! Likewise, I wish to thank all persons, who participated in my studies.

I would also like to take this opportunity to express my deepest thanks to Roger Keller for being a wonderful colleague, friend and a great support for this dissertation.

Above all, my deepest appreciation goes to Eike von Lindern, not only for proof reading this dissertation, but also for his help and patience with me and this thesis

Table of Contents

List of Figures

List of Tables

Chapter I

A social psychological perspective on health behaviour

1. Introduction

Being physically active or exercising is associated with better physical and mental health (e.g., WHO, 2010). Several studies from recent years have demonstrated the positive impact of physical activity and exercising on health (e.g., Cavill, Kahlmeier, & Racioppi, 2006; Mensink, 2002; Pate et al., 1995). In general, individuals who engage in physical exercise have a lower mortality risk than individuals who do not perform such an activity (Paffenbarger et al., 1993). In contrast, leading a sedentary lifestyle leads to a risk of heart disease, for example, which is more than twice as high compared to individuals who are physically active (Berlin & Colditz, 1990). With regard to Type II diabetes prevention, Sigal, Kenny, Wasserman, and Castaneda-Sceppa (2004) demonstrated that physical exercise prevents the development of Type II diabetes, and reduces the likelihood of developing secondary diseases (e.g, chronic back pain) associated with having Type II diabetes. There are also positive associations between physical activity and several aspects of mental health (e.g., Arndt, Rogers, & Landers, 2001; Biddle & Mutrie, 2001; Glenister, 1996; Gloz, Erkelens, & Sack, 1990; Sime, 1987). For example, being physically active enhances general well-being (Schwarzer, 2004) and physical activity is positively associated with cognitive performance (Möller, 1999). However, in most western industrialized countries (Hardman & Stensel, 2003), the majority of adults do not reach the physical activity levels recommended by health organisations and health agencies (e.g., CDC, 2012; WHO, 2012). In this regard, the Swiss population is no exception. A large number of Swiss inhabitants do not follow the physical activity recommendations (Lieberherr, Marquis, Storni, & Wiedenmayer, 2010). Therefore, the need to further investigate the determinants of engaging in and maintaining physical activity remains an important and worthwhile endeavour.

In general, there is a distinction between determinants of physical activity that mainly focus on the person, such as self-regulation abilities (e.g., Gollwitzer & Sheeran, 2006), and determinants that focus on the person's environmental (e.g., accessto sports facilities, like public swimming pools, etc.) and social context, such as social support (e.g., Uchino, 2009) or need support (Markland & Tobin, 2010; Niemiec, Lynch, Vansteenkiste, Bernstein, Deci, & Ryan, 2006). In terms of physical activity, social support has been one of the most studied determinants of the social context (e.g., Courneya, Plotnikoff, Hotz, & Birkett, 2000; Lippke, 2004; Trost, Owen, Bauman, Sallis, & Brown, 2002; Spanier & Allison, 2001; for a meta-analysis see Carron, Hausenblas, & Mack, 1996). Nevertheless, there are still several questions that have not been addressed thus far. One of these, which may present a potential problem, is that social support has mostly been examined in studies that apply correlational designs (e.g., van Straalen, De Vries, Mudde, Bolman, & Lechner, 2009), which may exclude causal inferences to these particular associations. Another area that requires further exploration is related to the kind of social support a person offers in order to help another person. Social support can be distinguished into perceived (defined as perception of potential help from the network; Uchino, 2009) and received social support. Received social support comprises the concrete support an individual actually receives (e.g., Schwarzer & Knoll, 2007). Generally speaking, it is still more common to study perceived than received social support (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007), although perceived support is not a measure of actual support transactions. In particular, with regard to investigating social support for physical activity, the actual support transactions seem to be of extraordinary relevance. An example of this is that about 66% of the Swiss population feel that "being together with good friends" is a motive

for physical activity engagement (Lamprecht, Fischer, & Stamm, 2008a). Indeed, there are studies that have investigated exercise-related social support with regard to the concrete assistance of another person, but the majority of these studies addressed received social support by only focussing on individuals who had already exercised together for a longer period of time (e.g., Gellert, Ziegelmann, Warner, & Schwarzer, 2011; Giles-Corti & Donovan, 2002). In so doing, the potential consequences and effects of exercising together cannot be appropriately investigatedbecause both partners are already a "well-rehearsed team", meaning that they are already accustomed to exercising together on a regular basis . Therefore, the aim of Chapter II is to contribute to the question of causality between received social support and physical exercise by applying an intervention- and control-group design.

An additional gap in the research with regard to investigating the health-promoting effects of social support is that social support has not yet been embedded into a comprehensive model of health behaviour change. One of these comprehensive models is the health action process approach (HAPA; Schwarzer, 2008). In addition to other psychological constructs in the HAPA, self-efficacy, self-regulation, and action planning play an important role in the process of behaviour change. However, these psychological constructs mainly represent cognitive factors (e.g.; beliefs in personal resources). Social factors, such as social support, have been omitted to date, although social exchange processes play an important role in the field of health behaviour change (e.g., Knoll & Schwarzer, 2007). Moreover, there is strong evidence for the link between social support and other important constructs for health behaviour change, such as self-efficacy (e.g., McAuley, et al., 2003) or action planning (e.g., Molloy, Dixon, Hamer, & Sniehotta, 2010). Therefore, the aim of Chapter III is to include received social support in the HAPA.

The idea that supportive acts by others may help to engage in a certain behaviour is also part of other psychological theories. One of these theories that comprises supporting behaviour from the social context is the Self-Determination Theory (SDT) by Deci and Ryan (1985, 2000), which includes the assumption of three psychological basic needs as a core construct (Deci & Ryan, 2000). Need satisfaction plays an important role in various life domains and is positively associated with intrinsic motivation for physical exercise (e.g., McDonough & Crocker, 2007; Russell & Bray, 2009). People seek need satisfaction in order to obtain and retain a personal context or environment that is healthy and supportive for their psychological well-being and development (Frederick-Recascino, 2004). That is, social contexts can be distinguished by their possibility to help or support need satisfaction. This contextual quality is also called "need support" (Markland & Tobin, 2010; Niemiec et al., 2006). If researchers wish to investigate the need supportive potential of a particular social context and social relationships, assessing the need satisfaction in this particular social context is the first step. Consequently, the aim of Chapter IV is to generate a reliable and valid German measure of need satisfaction in exercise.

This dissertation is divided into five chapters. In the first part of chapter, a theoretical background is presented and definitions of physical activity and physical exercise are given. In addition, information is provided on physical activity as a health related behaviour and on the activity behaviour of the Swiss population. In the second part of chapter I theories and models of health behaviour and health behaviour change (Social cognitive theory, HAPA, and SDT) are presented. The third part is comprised of the social perspective of health behaviour. More precisely, social support and need satisfaction in exercise are introduced as important qualities of the social context. The research questions of this dissertation are then developed and, finally, the two studies

that comprise this dissertation are presented in more detail. In Chapters II, III, and IV, the three research articles of this dissertation are presented in order to address the research questions. In Chapter V there is a comprehensive and detailed discussion of the study results. A main focus on the methodological aspects of this dissertation are made, as well as on recommendations for future research and further statistical analyses.

2. Theoretical Background

The first section of the theoretical background includes the definitions of physical activity and physical exercise, information on physical activity as a health behaviour and on the activity behaviour of the Swiss population. Second, theories and models of health behaviour and health behaviour change (Social cognitive theory, Health action process approach, and Self-determination theory) are presented. Then, the social perspective of health behaviour and health behaviour change is provided. Finally, social support and need satisfaction in exercise are introduced and elaborated on as important qualities of the social context.

2.1 Physical activity and exercise

When conducting research and running interventions in the field of physical activity, it is crucial to provideand utilise comprehensive and consistent terminology with regard to what exactly is meant when researchers refer to *physical activity, exercising*, or *sports*, for example. Furthermore, there are also differences in using these terms between the European mainland, North America, and the UK (Biddle & Mutrie, 2001). Therefore, the aim of this section is to introduce and specify the terms used. In additiona, the health advantages of being physically active on a regular basis, as well as possible risks and dangers, are outlined. Finally, the physical activity and sports behaviour of the Swiss population is described.

2.1.1 Concept and definitions

Physical activity can be described as any movement of the body produced by the skeletal muscles. The result of this movement is energy expenditure varying from a low to high level (e.g., Caspersen, Powell, & Christenson, 1985). When performing

health-enhancing physical activity, the energy expenditure should be above resting level (Bouchard & Shephard, 1994).

Several health organisations and health agencies have provided recommendations on how often and intensive physical activity should be in order to prevent diseases and to be health-enhancing. The WHO (2002) recommends 30 minutes of moderate activity per day as a minimum in order to prevent disease. The term *moderate* physical activity refers to activities that "… require a moderate amount of effort and noticeably accelerates of the heart rate". Examples of activities that are described as moderate include gardening, dancing, or brisk walking. Furthermore, for physical activities that are considered to be more exhausting, the term *vigorous* is used (e.g., running, team sports, aerobics). *Vigorous physical activity* is described as requiring a large amount of effort, causing rapid breathing and a substantial increase in the heart rate (WHO, 2012). Several associations publish guidelines and recommendations for optimum exercise duration and frequence. The WHO publishes the "Global Recommendations on Physical Activity for Health", which recommends 30 minutes per day of moderate exercise in order to prevent disease and/or to stay healthy. The American College of Sports Medicine (ACSM; 2010) also recommends 30 minutes of moderate physical activity on most days of the week. The Centre for Disease Control and Prevention (CDC; 2012) advises 150 minutes of physical activity per week. Individuals should additionally perform muscle-strengthening activities at least two times a week. In Switzerland, the "Netzwerk für Gesundheit und Bewegung Schweiz" (2007) provides guidelines for the amount of health-promoting physical activities as well: a minimum of 30 minutes of moderate physical activity per day, additional endurance training of 20 to 60 minutes three times a week, and strength and mobility training two times per week.

In addition to the term physical activity, the term *exercise* is widely used. It comprises the same elements as physical activity and is defined as "…planned, structured, and repetitive bodily movement…" (Biddle & Mutrie, 2001, p. 7). Therefore, more structured leisure-time physical activities, such as swimming, jogging, or visiting a fitness centre, are referred to as *exercise*.

In contrast, in German speaking countries, the usage of the term *sport* is very common. It serves as an umbrella term for any kind of organized participation in different kinds of exercising and it covers any kind of self-initiated exercising, such asjogging or swimming (Fuchs, 2003). This is in line with the definition by the European Sports Charter (2001), which states, "[sport]…means all forms of physical activity which, through casual or organised participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels".

Therefore, there are parallels between the operational definitions of *physical exercise* and *sport.* The aim of this dissertation is to find and describe determinants for the enhancement of certain activities, such as swimming, jogging, or visiting a fitness centre. Hence, the terms "physical exercising" or just "exercising" are used in Chapters II, III, and IV to describe some of the targeted dependent variables. In the following section an overview on being physically active and exercising as a health related and health-enhancing behaviour is given, as well as the risks of leading a sedentary lifestyle. Furthermore, possible negative health impacts associated with physical exercising are described.

2.1.2. Physical exercising as a health-related behaviour and health risks of a sedentary lifestyle

Although regular exercise has been documented as important for obtaining and retaining physical and psychological health (Cavill, Kahlmeier, & Racioppi, 2006), adults in most western industrialized countries lead a sedentary lifestyle (Hardman & Stensel, 2003).To illustrate, physical inactivity – along with stress and an unhealthy diet - is the main reason for cardio-vascular diseases (e.g., Baumann, 2004), diseases of the musculoskeletal system (e.g., Hänsel, 2007), and psychosomatic disorders (e.g., Schwarzer, 2004). Numerous studies have provided evidence for the positive influences of physical exercising on physical health (e.g., Baumann, 2004). For example, individuals who perform regular physical exercise have a lower risk of mortality than individuals who do not perform such an activity (Paffenbarger et al., 1993). In their meta analysis, Berlin and Colditz (1990) demonstrated that individuals who were physically inactive have a more than double risk of coronary heart disease than individuals who perform any kind of regular physical exercise. This reduction of disease risk has also been confirmed in other studies (e.g., Baumann, 2004; Oguma & Shinoda-Tagawa, 2004). In addition to other factors, such as obesity and high plasma lipid concentrations, high blood pressure is a major risk factor for having a heart attack. Vögele (2003) stated that just by enhancing physical exercise, high blood pressure could be sufficiently lowered. Thus, the risk for a heart attack can also be lowered with regular physical exercising.

Further to these positive associations between physical activity and physical health, it also has been demonstrated that, up to a certain degree, physical activity is linked to several aspects of psychological health. After workouts, most people report feeling better and experience an increase in well-being (Schwarzer, 2004). The

findings on the effects of physical exercise on depression are somewhat heterogeneous. There is evidence that physical exercise has a beneficial effect on mild to moderate depression (e.g., Arndt, Rogers, and Landers, 2001; Biddle & Mutrie, 2001; Glenister, 1996; Gloz, Erkelens, & Sack, 1990; Sime, 1987), but, in general, the impact of physical activity on depression is better when the depressive symptoms are stronger and the respective person is less physically trained. However, there are studies that have been unable to demonstrate this beneficial effect (e.g., Gauvin, Rejecski, Norris, & Lutes, 1997). Nevertheless, there are also positive associations between cognitive performance and physical activity (Möller, 1999). In addition, there is evidence for the protective effect of physical excising on the development of Alzheimer's disease (Melzer et al., 2004) and improving cognitive functions, in terms of memory, in older adults (Lachmann, Neupert, Bertrand, & Jette, 2006).

It is important to note that although there are numerous positive health outcomes of regular exercising, there are also some negative impacts on health related to physical activity. The Robert Koch Institute indicates that exercising can entail small or even serious sports accidents (Schubert, Horch, Kahl, Köster, Meyer, & Reiter, 2004). However, these possible negative impacts mostly occur when individuals are untrained or already in poor health, thus emphasizing the importance of ensuring correct practice (e.g., warming up, recommended protective gear, etc.) when engaging in exercising (Melzer et al., 2004). Other possible sources of injury while doing physical exercise include competitive sports or performing high-risk sports (see Aufmuth, 1989 for a definition; and Suva, 2012, for a short list of possible high-risk sports). The relationship between the benefits and risks and harms of different levels of physical activity is shown in Figure 1. As the intensity of physical activity increases, the benefits and risks also increase. However, if individuals perform

activities to train for competitive sports, the health benefits remain stable, but the risks and dangers increase (WHO, 2002). Nevertheless, the positive health impacts of moderate physical activity are indisputable. If physical activity is performed in an appropriate manner (e.g., 30 minutes of moderate physical activity per day, as recommended by the WHO, 2002, for example), then the health impacts exceed the possible risks and harm (Melzer et al., 2004).

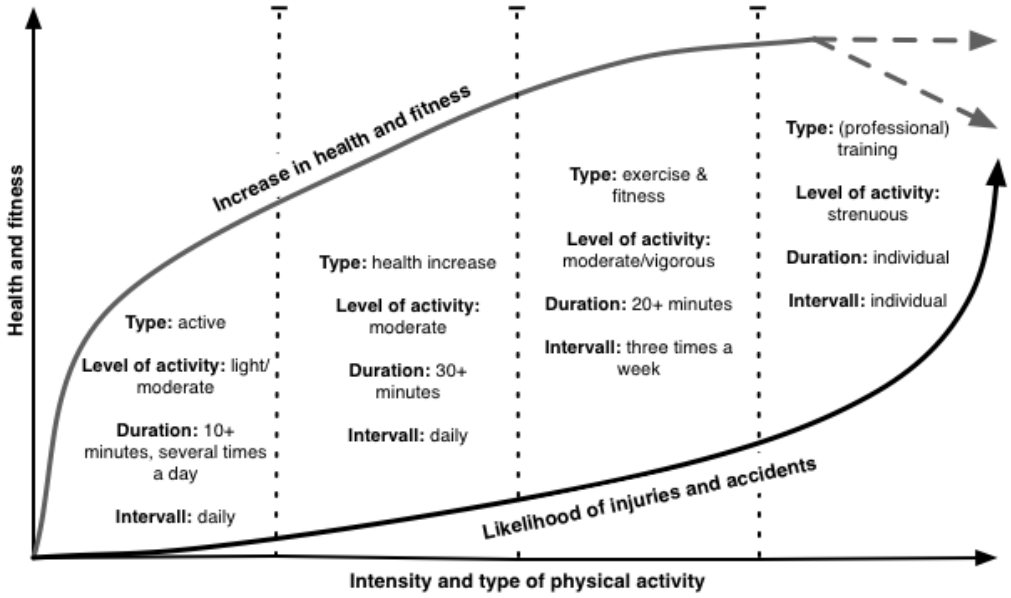


Figure 1. Relationship between the amount of physical activity and health effects (adapted from WHO, 2002).

2.1.3 Physical activity and exercising in the Swiss population

As in most western industrialized countries (e.g., Hardman & Stensel, 2003), a large number of Swiss inhabitants do not match the physical activity recommendations reported above (Lieberherr, Marquis, Storni, & Wiedenmayer, 2010). Three out of five Swiss inhabitants cannot be regarded as "active" in the sense that they would match the criteria for sufficient physical activity set by the "Netzwerk für Gesundheit und Bewegung Schweiz" (2007) reported in 2.1.1 (Lieberherr, et al., 2010). Furthermore, 16% of the Swiss inhabitants can be categorized as "inactive",

which means they engage in phsyical activity that induces rapid breathing (see above, vigorous physical activity) less than one time per week. Therefore, most Swiss inhabitants can be regarded as “partly” or “sporadically active”, which means they are physically active, but not to the extent or not as regular as recommended (Lieberherr, et al., 2010).

These findings are only partially reflected in the results of the Swiss-wide survey “Sport Schweiz 2008” (Lamprecht, Fischer, & Stamm, 2008a), which in contrast, indicated that more than half of the respondents reported to engage in physical exercising several times a week. This finding suggests that some of the respondents do match the above-reported criteria of health related physical activity; however, it must be taken into consideration that this information refers to physical exercising in the sense of activities like such as running, and team sports, etc. On the contrary, one third of the Swiss population reported to almost never engage in this these kinds of activities, and 17.3% stated to that they only exercise only about once a per week. Therefore, those last two groups do not reach the criteria of health related physical exercising, which with regard to health promotion means, that there is still room for improvement.

Another issue is the development of physical activity and exercising from childhood to adulthood. It is important to note that, in general, the physical activity decreases around the age of 17 (Lamprecht, Fischer, & Stamm, 2008b) and again between the ages of 20 and 40 the physical activity again decreases (Lamprecht, Fischer, & Stamm, 2008a). This development could be explained by the transitions that individuals experience during these life-periods. This is, such as finishing school and beginning to work or going to university. Similarly, there are life-changes that happen between the age 20 and 40, such as finishing university and beginning a

regular job, or childbirth (only for women). According to these findings from literature, especially these age-spans, in particular, should be focussed on when promoting health through engaging in or maintaining physical activity.

In conclusion, although most Swiss inhabitants are at least partly active, there is room for improvement. Most individuals are indeed engaged in some kind of physical activity, but do not reach the recommended levels of frequency and duration. Furthermore, the decreasing trend of physical activity in early adulthood ought to be buffered.

In terms of health promotion and prevention, these results highlight the importance of finding ways and determinants to develop interventions in order to support individuals in enhancing and maintaining their physical exercise.

2.2 Theories and models of health-behaviour change

Changing behaviour, especially health behaviour, is difficult to acheive. This is the reason that numerous psychological constructs and complete theories aim to explain health behaviour and health-behaviour change. In this chapter, three well-established theories in the field are introduced. First Bandura's social cognitive theory (SCT; Bandura, 1989) is presented. Although Bandura did not originally design the SCT as a theory for health behaviour, but rather for social behaviour in general (Bandura, 2000), the SCT has widely been used within the field of health psychology (e.g., Bandura, 2004). The self-determination theory from Deci and Ryan is (SDT, Deci & Ryan, 1985; 2000) then described, followed by an explanation of the health action process approach (HAPA; Schwarzer, 2008).

When focussing on physical exercising and health behaviour, these three major theories have all contributed to generating a more comprehensive understanding of the topic under scrutiny. The important contribution of the SCT was to establish different

kinds of expectancies as anticipatory control mechanisms in order to regulate the pursued behaviour (Bandura, 1989; Schwarzer & Fuchs, 1995). In essence, these are outcome expectancies and perceived self-efficacy. SDT distinguishes between being intrinsically or extrinsically motivated for a certain behaviour (Deci & Ryan, 1985; 2000). In addition, what is special about the SDT is the discrimination of several styles of extrinsic motivation. Focussing mainly on the process of translating intentions into behaviour, the HAPA significantly contributed to bridge the so-called intention-behaviour gap (Sheeran, 2002) by using several self-regulatory mechanisms. In the following, these processes and all three theories are explained in more detail.

2.2.1 Social Cognitive Theory

Change in behaviour can be facilitated by a personal sense of control. Bandura (1989) labelled this sense of control *perceived self-efficacy*. Self-efficacy plays a central role in SCT and can be described as a person's perceived ability to master arising demands or barriers successfully (Bandura, 1986, 1989). Moreover, individuals who experience themselves as self-efficient can carry out a more self-determined and active lifestyle. For example, they set higher goals and stick to them (e.g., Locke & Latham, 1990). In addition to self-efficacy, *outcome expectancies* play a crucial role within SCT, and are defined as the outcomes people expect their actions to cause. They can be described as balancing the expected costs and benefits of different behaviours, which, in this case, involves engaging in health-behaviour change or not (Bandura, 2004). More precisely, three different kinds of outcome expectancies can be distinguished. *Physical outcomes* are the expected positive and negative effects of the "new" behaviour. This includes, for example, the possible advantages and disadvantages of the new behaviour. The second set of outcome expectancies are *social outcomes* in that behaviour is also regulated by the social

reactions it causesin personal social relationships, for example. Finally, the third type of outcome expectancy is positive and negative *self-evaluative reactions*to health-behaviour and health status (Bandura, 2004). A simplified overview of SCT is given in Figure 2.

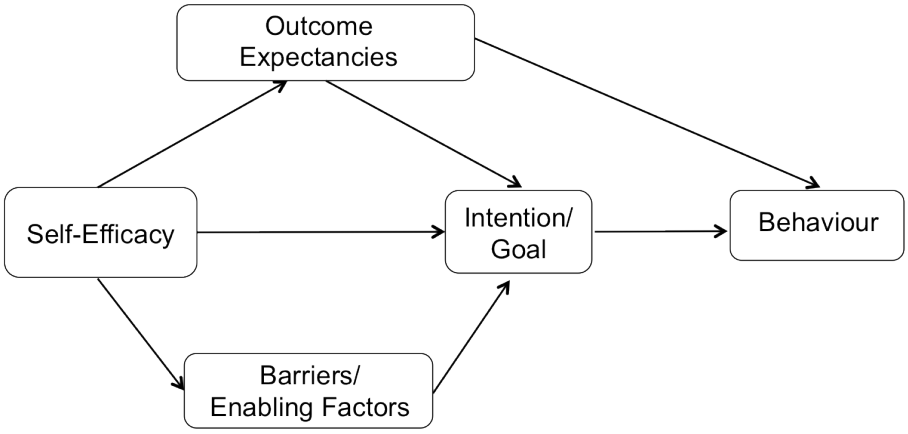


Figure 2. Simplified model of the social cognitive theory by Bandura (2000).

Outcome expectancies are considered particularly important for intention formation, whereas self-efficacy is important for both intention formation and actually engaging in the targeted behaviour (Schwarzer & Fuchs, 1995). Moreover, self-regulatory strategies, such as self-monitoring, are described within SCT as also important for behaviour engagement (see Bandura, 1991).

In summary, SCT is a "model of reciprocal causation" (Bandura; 1989, p. 1175), in which cognitive, affective, personal, and environmental factors - all understood as interacting determinants - are guided by different expectancies.

2.2.2. Self-Determination Theory

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) provides a framework for the investigation of human motivation and personality and presumes that the motivation for certain behaviour varies along a motivational continuum ranging from intrinsic to extrinsic motivation (see Figure 3). Intrinsic motivation indicates a self-determined behaviour, meaning that a person has interest in and

experiences fun during activity (Deci & Ryan, 2000). Extrinsic motivation is subdivided into four motivational styles: integrated, identified, introjected, and external regulation. These styles can be distinguished by their proportion of self-determination. External regulation is the motivational style with the smallest proportion of self-determination. It is a controlled behaviour and its origin is external (e.g., avoiding problems with other people). When behaviour is regulated introjectedly, it is characterized by avoiding disapproval from oneself (e.g., feeling quilty). When people act through identified regulation, they identify with the value of the action. Finally, among the different kinds of extrinsic regulation, integrated regulation has the highest degree of self-determination (Ryan & Deci, 2007). The more self-determined a behaviour is, the more likely a person persists in it (Ryan & Deci, 2004) and the more well-being is associated (Ryan, Deci, & Grolnick, 1995). People can develop the motivational style of certain behaviours from less self-determined (external regulation) to more self-determined (integrated regulation) by "internalization" (Ryan & Deci, 2004).

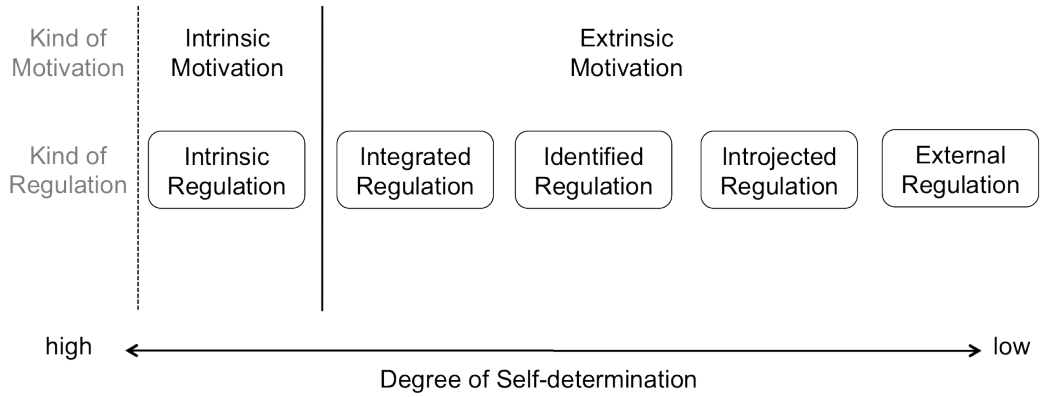


Figure 3. The continuum of self-determination (referring to Deci & Ryan, 2002).

With regard to health-related behaviour change, this behaviour change is more effective and lasting when the individuals' motivation is more self-determined (Ng, Ntoumanis, Thørgersen-Ntoumani, Deci, Ryan, Duda, & Williams, 2012).

One important concept within SDT is the assumption of three fundamental basic psychological needs, namely autonomy, competence, and relatedness. As need satisfaction is assumed to be affected by the individuals' social context, need satisfaction and support is explained in more detail in part 2.3, where a social perspective on health behaviour and health-behaviour change is presented.

2.2.3 Health Actions Process Approach (HAPA)

In contrast to other theories dealing with the explanation and prediction of behaviour (e.g., Theory of planned behaviour; Ajzen, 1991), especially health behaviour, the HAPA mainly focuses on the process of translating intentions into behaviour. For this, the HAPA can be divided into *motivational* and *volitional phases* (see Figure 4). The *motivational phase* is composed of risk awareness, positive and negative outcome expectancies, self-efficacy, and the results of forming an intention to act (e.g., enhance exercising). Risk awareness can be described as a minimum level of concern about a person's health. It must exist before people start considering whether to initiate or change a certain kind of health behaviour (e.g., Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008). Outcome expectancies can be characterised by the process of balancing the advantages and disadvantages of a certain behaviour. Intention formation becomes more likely when people expect more positive behavioural outcomes than negative behavioural outcomes (Scholz, Nagy, Schüz, & Ziegelmann, 2008). The third preintentional factor specified in the HAPA is self-efficacy, which can be described as a person's belief in his/her capability to perform a specific behaviour in order to reach an intended goal. After people have formed an intention to act (e.g., enhance exercising), this intention ought to be translated into behaviour. In so doing, people enter the *volitional phase* of the HAPA, where action planning, action control, and again self-efficacy help to conduct the desired behaviour.

Action planning (Leventhal, Singer, & Jones, 1965) is comparable with the concept of implementation intentions (Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997) and involves formulating simple plans, such as when, where and how to exercise. Action control is based on cybernetic models of self-regulation (e.g., Carver & Scheier, 1998; 2002) and comprises three cognitive processes: awareness of standards, self-monitoring, and self-regulatory effort. Awareness of standards means that an individual should always be aware of his/her intentions, such as exercising three times a week, for example. Individuals who wish to engage in physical exercise three times a week need to monitor themselves in order to evaluate if the performed actions correspond with the intended goal. This process is called "self-monitoring". Finally, if the individual realizes discrepancies between his/her actions and his/her intentions then counteracting in terms of self- regulatory effort must be invested. Previous research has demonstrated that action control is a powerful predictor in change of physical activity (Scholz, Nagy, Schüz, & Ziegelmann, 2008; Sniehotta, Nagy, Scholz, & Schwarzer, 2006). Awareness of standards, self-monitoring, and self-regulatory effort are conceptually distinct processes and self-regulation failure can occur in any of these processes. An additional assumption of the HAPA is that the process of health-behaviour change does not end with successful engagement in the new behaviour. With different types of self-efficacy beliefs (maintenance and recovery self-efficacy), it provides psychological constructs, which are also important for maintaining or re-establishing certain health behaviours. Maintenance self-efficacy describes a self-evaluative component that the individual is sure to maintain certain behaviour even under difficult circumstances (e.g., when the individual experiences barriers during goal pursuit). Recovery self-efficacy is important when the individual

wants to re-engage in a certain behaviour after a break or relapse into the former behaviour (Luszczynska & Schwarzer, 2003; Scholz, Sniehotta, & Schwarzer, 2005).

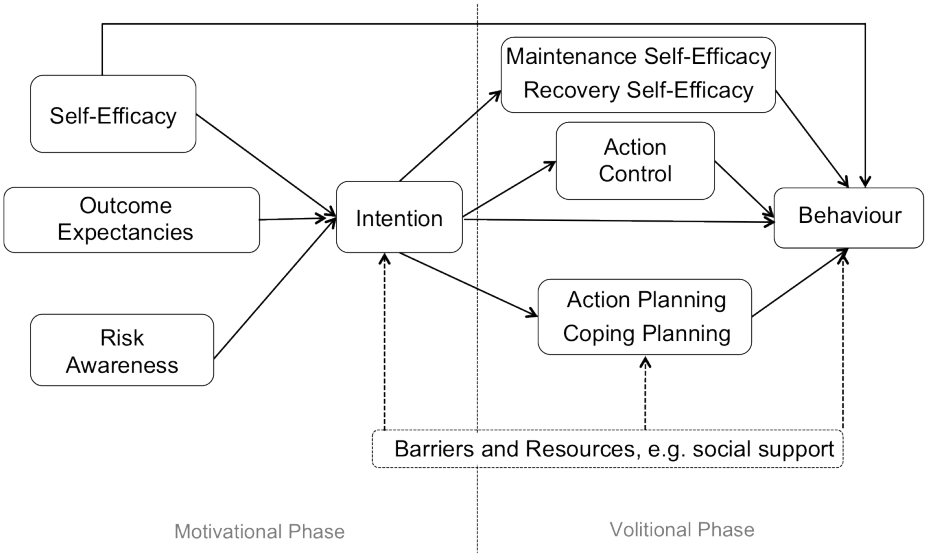


Figure 4. The Health Action Process Approach (HAPA) by Schwarzer (1992; 2008)

With regard to the social processes of the adoption and maintenance of health behaviour, all theories presented suggest that social processes also play an important role. Within the HAPA, resources and barriers (e.g., social support) are said to affect the behaviour itself, as well as planning and intention. Furthermore, the SDT assumes need satisfaction to depend on the individual's social context. As stated above, Bandura (2004) also found that social outcome expectancies influence self-regulation. Nevertheless, social processes have not yet been consequently embedded into a theory or model of health behaviour. These social processes - social integration, need satisfaction, social and need support - are described below in more detail and with reference to physical exercising.

2.3 Health behaviour and health-behaviour change: a social psychological perspective

Having comfortable and enjoyable social relationships with others is important for an individual's mental and physical health (cf. House, Landis, & Umberson, 1988;

Schwarzer & Knoll, 2007, 2010;). However, research in this area has dealt with different conceptualisations of social relationships and different theoretical frameworks to explain and describe social determinants that are relevant for health behaviour and health behaviour change. There are approaches that cover the quantitative aspects of social relationships, such as *social integration* and the description of *social networks*, as well as concepts that cover the qualitative dimensions of social relationships, such as *social support*. Moreover, additional insights can be found when taking into account the psychological theories that deal with human needs (e.g., Deci & Ryan, 1985, 2000; Hull, 1943; Murray, 1938), especially with the *need to belong* (cf. Baumeister & Leary, 1995). This need to belong is one main quality of social relationships, on that is important for perceiving and receiving social support in a satisfactory manner (see Ryan & Solky, 1996). The need to belong or "need for relatedness" is also an important construct within Deci and Ryan's self-determination theory (SDT; Deci & Ryan, 1985, 2000; and see 2.2.2).

Therefore, the aim of this chapter is to explain in more detail the social factors outlined above that may exert an influence on health and health behaviour change, with special attention to physical activity and exercising.

2.3.1 Social integration, social networks, and health

Social integration describes the structure and quantity of social relationships (Schwarzer & Knoll, 2007) and mainly covers aspects such as the size (number of network members), density, and connectedness of social networks (cf. Berkman, Glass, Brissette, & Seeman, 2000). Social integration was found to be a predictor for mortality risk (Berkman & Syme, 1979; Manzoli, Villari Pirone, & Boccia, 2006). For example, Umberson (1987)showed that married persons and those with children engaged in less risky behaviour than singles or persons without children. Holt-

Lunstad, Smith, and Layton (2010) conducted a meta-analysis on social relationships and mortality risk and conclude that the lack of social contacts is comparable with the negative health impact of well-established risk factors for mortality (e.g., smoking, lack of physical activity). With regard to physical activity and exercise as one kind of health related behaviour, Pettee and colleagues (2006) found that being married was associated with higher levels in physical activity in both partners and that spousal physical activity is an important determinant for physical activity participation.

2.3.2 Social support

Definitions and conceptualisation of social support

Social support can be regarded as resources provided by others in order to help someone (Schwarzer & Knoll, 2010). It also deals with the interaction between two or more individuals to change problematic conditions on the part of the person concerned (Knoll, Scholz, & Rieckmann, 2011). In contrast to social integration, social support covers the qualitative aspects of social relationships, such as the perception of potential help from the network (*perceived support*) or the concrete support one receives (*received support*) when needed (Uchino, 2009). Therefore, received social support is described as the concrete and tangible support an individual receives. Furthermore, it also includes the actual support transaction of the persons involved in the supporting actions. Although these actual support transactions are very relevantto health behaviour change, for example, it is still more common to investigate "perceived" rather than "received" social support (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007).

Several types or functions of social support can be distinguished, such as emotional, instrumental, and informational (Schwarzer & Knoll, 2007). *Emotional social support* refers to the emotional well-being of the recipient and covers aspects

such as encouragement and comfort. *Instrumental social support* refers to supporting the recipient by means of assisting with the problem or donating goods (Schwarzer & Knoll, 2010). Finally, *informational social support* covers functions such as providing relevant information and giving advice (Schulz & Schwarzer, 2003; Schwarzer & Knoll, 2007).

Social support: physical activity and exercising

The social support of important others (e.g., family and friends) can play a crucial role in the adoption and maintenance of physical activity and exercise (Courneya, Plotnikoff, Hotz, & Birkett, 2000; Lippke, 2004; Trost, Owen, Bauman, Sallis, & Brown, 2002; Spanier & Allison, 2001). In a meta-analysis, Carron, Hausenblas, and Mack (1996) identified family support and support of important others as important factors for exercise adherence behaviour. In their literature review on determinants for initiation and maintenance of physical activity among older adults, van Straalen, De Vries, Mudde, Bolman, and Lechner (2009) identified social support from significant others and having a sports partner as positively associated with the initiation of physical activity. In terms of maintaining physical activity, positive associations for being supported by group members and sport partners were found as well. Likewise,Spanier and Allison (2001) demonstrated that general social support in terms of the frequency and the quality of having contact with important others was associated with higher levels of physical activity. In addition a study by Fischer Aggarwal, Liao, and Mosca (2008) showed an association between instrumental and emotional social support with physical activity engagement. Similar results were obtained by Kouvonen and colleagues (2011), who found that emotional and practical (instrumental) social support from a close person helps to maintain the recommended levels of physical activity. Furthermore, these results indicate that

practical social support may serve as a predictor for change towards a more active lifestyle.

In contrast to the studies described above that mainly focus on the associations of social support and physical activity in general, the following studies mainly deal with instrumental social support operationalized as exercising together or having an exercise companion. For example, Brehm and Erberhardt (1995) investigated fitness club members, and found out that those who felt supported by a close person visited the centre more frequently. Moreover, persons who renewed their fitness centre contracts exercised more often with an exercise companion than persons who later terminated their contracts. Results from a study by Giles-Corti and Donovan (2002) showed that the greater the number of important others who exercised regularly with the respondent, the more likely recommended levels of physical activity were achieved. Likewise, Gellert and colleagues (2011) implemented a health promotion program for older adults and found that those participants who experienced social support and whose partners were also actively involved in the program could increase their physical activity over time. Dunton, Berrigan, Ballard-Barash, Graubard, and Atienza (2009) differentiated between the duration and the intensity of an exercise episode and were able to demonstrate that participants who exercised with an exercise companion reported to exercise longer but less intensively than participants exercising alone. The study by Oka, King, and Young (1995) dealt with the different effects of social support in general and social support for physical exercise on exercise behaviour. The authors showed that exercise-specific physical activity was the best predictor for exercise adherence.

The indirect and enabling effects of social support on exercising

The results reported above provide evidence for the direct effect of social support on physical activity. Indeed, there is a growing body of literature (e.g., Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993; McAuley, Jerome, Elavsky Marquez & Ramsey, 2003; Molloy, Dixon, Hamer, & Sniehotta, 2010; Anderson, Wojcik, Winett, & Williams, 2006) that investigates mediators of the path from social support to physical activity in order to explain the psychological mechanisms through which social support affects health behaviour. In studies on recovery from traumatic stress, Benight and Bandura (2004) found that social support enhanced self-efficacy and this, in turn, facilitated recovering from the stressful event. They labelled this mechanism "enabling effect". In the domain of physical activity and exercising, McAuley and colleagues (2003) demonstrated a similar effect of influencing exercise behaviour through the mediation of self-efficacy (see also Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993). This pathway from social support to physical activity through self-efficacy has also been extended by other self-regulatory mechanisms. For example, Anderson and colleagues (2006) demonstrated that social support directly influenced self-efficacy and self-regulation. Furthermore, self-regulation was also indirectly affected by social support through self-efficacy. In turn, self-efficacy and self-regulation predicted physical activity. Furthermore, in recent studies, planning was also found to be a mediator of the association between social support and physical activity (Molloy, Dixon, Hamer, & Sniehotta, 2010). Moreover, some studies have also addressed the question of whether receiving social support in terms of making plans with someone else as a self-regulatory strategy might help to accomplish a targeted health behaviour. Prestwich and colleagues (2005) labelled this approach "collaborative implementation

intentions", and found higher levels of breast self-examination (BSE) rates in women who planned to perform a BSE with their partner. Similarly, Burkert, Scholz, Gralla, Roigas, and Knoll (2011) instructed their participants (prostatectomy-patients) to plan, with their partner, the performance of a pelvic-floor exercise. However, there were no specific intervention effects. These mixed and partly inconsistent findings demonstrate that there is a need for further research in analysing the role of received social support concerning initiating, increasing, and maintaining health behaviour.

2.3.3. The concept of basic psychological need satisfaction and need support

Further to the concept of social support, the idea that supportive behaviours by others might help an individual to engage in a certain behaviour (e.g., Brehm & Eberhardt, 1995) is also part of other psychological theories. One of these is the Self-determination theory (SDT) by Deci and Ryan (1985, 2000), which is also described, on a more general level, in 2.2.2. In this section, the aim is to explain the idea of the satisfaction of the three basic psychological needs (autonomy, competence, and relatedness) presumed by Deci and Ryan (2000) which is a very important concept within SDT.

Autonomy refers to experiencing free choice and feeling like the initiator and source of one's own action (deCharms, 1968; Deci&Ryan, 1985). People feel *competent* when they interact with their environment effectively and when they can influence it in a successful way (Deci, 1975; White, 1959; Vlachopoulos & Sotiria, 2006). Thus, competence is comparable to Bandura's self-efficacy (1997). Perception of *social relatedness* is based on building and keeping relationships, as well as experiencing a sense of mutual respect and reliance with others (Baumeister & Leary, 1995; Deci & Ryan, 2002).

These needs are considered to be the nutriments for the individuals' optimal psychological functioning, as well as for psychological health and well-being (Deci & Ryan, 2000). Need satisfaction can facilitate internalization and is important for experiencing self-determination and intrinsic motivation (Ryan & Deci, 2004). It is predicated on the individuals' social context. Therefore, SDT assumes the existence of social contexts that support need-satisfaction and those that thwart need satisfaction (Deci & Ryan, 2000; 2002). Three need-satisfaction supporting dimensions of the social context have been identified in SDT research: autonomy support, structure, and involvement (Deci & Ryan, 1991; Markland, Ryan, Tobin, & Rollnick, 2005; Ryan et al., 1995). These three social-context dimensions are supposed to affect satisfaction of the three needs. The concept of *autonomy support* describes an interpersonal climate characterized by helping individuals to recognize their possibilities for free choice and base their actions on their own personal reasons (Markland, Ryan, Tobin, & Rollnick, 2005). In contrast, controlling social contexts deal with rewards, punishments, and judgmental evaluations to pressure the individual in a certain direction (Williams, 2002). By means of the *structural* dimension, the satisfaction of competence should be facilitated. Individuals are assisted in developing clear expectations and setting realistic goals regarding the process of behaviour change. Moreover, the social context encourages the individual to feel capable of engaging in appropriate actions towards the intended behaviour-change process (Markland & Tobin, 2010). Finally, support for relatedness is represented in the *involvement* dimension and describes the extent to which the individual experiences his/her social context as interested in the individual itself and his/her well-being (Reeve, 2002). This dimension mainly deals with the emotional resources of the social relationship between the individual and his/her social context and mutual trust (Markland, Ryan, Tobin, & Rollnick, 2005).

Although these three dimensions of need support are described as being independent, they are highly interrelated (Ryan, 1991). Consequently, most measures of need support assess it one dimensionally and label this factor "autonomy support" (Markland & Tobin, 2010). However, as the SDT characterisation of need supportive factors is broader than "autonomy support", Markland and Tobin (2010), as well as Niemiec et al. (2006), proposed the use of "need support" instead. Furthermore, the usage of need support better depicts the fact that there are different effects of three kinds of need support (autonomy support, structure, and involvement) on the different forms of regulation (see Deci & Ryan, 2000; Koestner & Losier, 2002; Markland & Tobin, 2010).

2.3.4. Basic psychological need satisfaction in exercise

Need satisfaction plays an important role in various life domains due to the fact that people seek need satisfaction in order to obtain and retain a personal context or environment that is healthy and supporting for their psychological well-being and development (Frederick-Recascino, 2004). As mentioned above, need satisfaction helps to internalize a certain behaviour (Ryan & Deci, 2004), which results in a behaviour that becomes more self-determined or even intrinsically motivated, which, in turn, leads to more persistence in performing this behaviour. With regard to being physically active or exercising on a regular basis, a key issue is persistence in performing. Therefore, when investigating conditions that help individuals to engage in regular physical exercising, need satisfaction plays a crucial role. Likewise, SDT has widely been applied when studying exercise and physical activity (e.g., Ryan & Deci, 2007; Ryan, Williams, Patrick, & Deci, 2009; Vlachopoulos, Kaperoni, & Moustaka, 2011).

Prior research in the exercise domain has provided evidence for the association between need satisfaction and self-determined motivation (e.g., McDonough & Crocker, 2007; Russell & Bray, 2009; Vlachopoulus & Michailidou, 2006) as well as the relationship between self-determined motivation and physical exercise (e.g., Edmunds, Ntoumanis, & Duda, 2006; Wilson & Rodgers, 2004; Wilson, Rodgers, Blanchard, & Gessell, 2003). For example, Wilson, Rodgers, and Fraser (2002) reported associations between need satisfaction, intrinsic motivation, and self-reported physical exercise. Gagné, Ryan, and Bargmann (2003) demonstrated that daily well-being is associated with the daily fluctuations of need satisfaction among adolescent female gymnasts.

The above-reported results demonstrate the importance of investigating need satisfaction and need-satisfying social contexts for physical exercise. To that end, the first step in studying such conditions is the development of reliable and valid scales to assess the psychological need satisfaction in exercise. Currently, scales that assess need satisfaction in general (see Gagné et al., 2003) are in use, as well as instruments that assess specialized need satisfaction, such as "in relationships" (e.g., La Guardia, Ryan, Couchman, & Deci, 2000) or "at work" (e.g., Baard, Deci, & Ryan, 2004).

Measuring basic need satisfaction in exercise

Given the importance of domain-specific instruments to assess psychological constructs adequately (e.g., Ryan, 1995; Vlachopoulos & Michailidou, 2006), designing a scale to estimate the extent to which the three basic needs are satisfied in exercise was essential. Therefore, Wilson and colleagues (2006) introduced the Psychological Need Satisfaction in Exercise Scale (PNSE), which is an 18-item measure to assess the satisfaction of autonomy, competence, and social relatedness during exercise situations. Wilson and colleagues (2006) conducted two studies to

explore the factorial composition and to evaluate aspects of construct validity. The explorative factor analyses conducted displayed good factorial structures and factor definitions overall. The final solution was "…interpretable and consistent with SDT" (Wilson et al., 2006, p. 237). In a second study, a confirmatory factor analysis was calculated and, in accordance with the first study, the three factorial structure could be affirmed. The fit indices were all in an adequate range: CFI = 0.94, Incremental fit index (IFI) = 0.94, SRMSR = 0.07 and RMSEA = 0.90. Cronbach's alpha coefficients were greater or equal to $\alpha = 0.90$. Likewise, Vlachopoulos and Michailidou (2006) presented "The Basic Psychological Needs in Exercise Scale" (BPNES) in Greek. "The BPNES is a domain-specific self-report instrument designed to assess perceptions of the extent to which the innate needs for autonomy, competence, and relatedness (Deci & Ryan, 2000) are satisfied in exercise" (Vlachopoulus & Michailidou, 2006, p. 179). Vlachopoulus and Michailidou (2006) demonstrated an adequate factor structure (Non-Normed Fit Index (NNFI) = 0.97, CFI = 0.98, SRMR = 0.04, RMSEA = 0.05) including its reproducibility across two separate samples (NNFI = 0.96, CFI = 0.97, SRMR = 0.06, RMSEA = 0.04), internal consistency (all Cronbach's alpha values were greater than $\alpha = 0.8$), test-retest reliability over a four week period (intraclass correlations for all three sub scales were $ICC = 0.97$) and the need-score were mainly unaffected by social desirability (low and non significant correlations between the BPNES sub scales (autonomy, competence, and relatedness) and social desirability). A French measure to assess need satisfaction in exercise was introduced by Gillet, Rosnet, & Vallerand (2008). In addition to the other researchers, they showed that their measure had a sufficient factor structure (NNFI = 0.93, CFI = 0.95, IFI = 0.95, SRMR = 0.07, RMSEA = 0.06) and internal consistency (Cronbach's alpha values ranged between $\alpha = 0.72$ and $\alpha = 0.77$). Based on this French version,

Domínquez, Martín, Martín-Albo, Nuñez, and León (2010) constructed a Spanish measure of need-satisfaction in exercise. The reported fit indices were acceptable: IFI = 0.91, CFI = 0.91 and RMSEA = 0.07. The Cronbach's alpha values per sub scale ranged from $\alpha = 0.78$ (perception of competence) to $\alpha = 0.88$ (perception of social relatedness) in the pretest. Ten weeks later the authors carried out a second measurement to calculate the test-retest reliability. The correlations were as follows: autonomy $r = 0.70$, competence $r = 0.71$, and social relatedness $r = 0.68$. This is considered as acceptable when taking the long time interval of ten weeks into account (Domínquez, Martín, Martín-Albo, Nuñez, & León, 2010).

3. Research Questions

In Chapter I, part 2.3.3 the importance of social support and in 2.3.3 and 2.3.4 the importance of need satisfaction for physical exercise, as well as for determinants (e.g., self-efficacy, action control, or intrinsic motivation) that help to engage in and to maintain exercising, were presented. The following research questions are analyzed, and addressed through these findings in more detail in the Chapters II, III and IV.

In this chapter, the research questions emerging from the theoretical background and from the current literature review are defined.

3.1. The importance of received social support for physical exercising

As illustrated in section 2.3.2, social support can play an important role in adopting and maintenaningphysical exercise. Thus far, the research has mainly focussed on more general aspects of social support on exercising, such that having contact with important others was positively connected to higher levels of physical activity (Spanier & Allison, 2001). In other words, these studies found associations between social support and physical exercising, but did not investigate mechanisms by which social support might help to engage in or maintain exercising (e.g., Fischer et al., 2008; Kouvonen et al., 2011). Moreover, social support has also been assessed on a general level and not on an exercise- or sport-specific level. Additionally, most of the reported studies have addressed perceived social support, but only a few have focused on received social support (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007).

Received social support, in particular, involves specific supportive behaviours provided to the recipient by persons from the recipient's social context (Haber, Cohen, Lucas, & Baltes, 2007). To that end, sport-specific received social support seems suitable for describing and predicting physical exercise and psychological constructs

(e.g., self-efficacy and action control, see Chapter I part 2.2.) that help engaging in and maintaining physical exercising. One possibility to operationalize received sport-specific social support is having a person to exercise with. This approach would comprise the *concrete assistance* with which received social support is defined (Schwarzer & Knoll, 2007; 2010). Indeed, there are studies that have focussed on more exercise-specific support and have operationalized received social support by the availability of persons to exercise with (e.g., Brehm & Eberhardt, 1995; Dunton et al., 2009; Gellert et al., 2011; Giles-Corti & Donovan, 2002; Oka et al., 1995). However, in most of these studies the investigated samples made use of exercise companions they had already exercised with for a longer period of time. In so doing, the potential consequences and effects of exercising together could not be investigated appropriately because both partners are already a well-rehearsed team.

Another aspect, which has not been very well studied thus far, is the time course of received social support, in general (van Stralen et al., 2009), and time course with regard to social support for physical exercise provided by an exercise companion.

Consequently, the first aim of this thesis was to conduct a randomized intervention- and control-group study. To the best of our knowledge, the effects of social support on exercising have not yet been investigated within an experimental approach. Therefore, the social support intervention conducted involved finding a new exercise companion and exercising together for eight weeks, which should ensure that the participants do not rely on persons they already exercise with, even if on a rare or irregular basis. This way, the starting point for each participant in the intervention group was equal. Received instrumental and emotional social support should be addressed this way and utilized to enhance and maintain physical exercise on the part of the respondent. In line with the work of Abraham and Michie (2008), social support

can be categorized as a behaviour-change technique. Additionally, an important aspect of the present thesis was the consideration of received social support asthe concrete assistance. Received social support, compared to perceived social support, is less studied, even though studies that have investigated the effects of having an exercise companion as the instrumental aspect of received social support have shown promising results (e.g., Brehm & Eberhardt, 1995; Dunton et al., 2009; Gellert et al., 2011; Giles-Corti & Donovan, 2002; Oka et al., 1995). In addition, this study was designed as a longitudinal design with ten measurement time-points. The advantage of such an approach is the generation of information concerning inter- and intra-individual changes of received social support and physical exercising. As a first step in order to receive a more detailed picture of received social support and physical activity over time, the following research questions and hypotheses associated were investigated by running an intervention- and control-group design:

A1. Do individuals in the intervention group and control group differ in their physical exercising over time?

> Hypothesis A1: Individuals in the intervention group are able to significantly enhance their physical exercising more than the control group over the time of the study. This is because of the possible effect the new exercise companion has on the physical exercise behaviour of the individuals in the intervention group.

A2. Do individuals in the intervention group and control group differ in their received instrumental social support?

> Hypothesis A2: Because the individuals in the intervention group are more supported by their new exercise companion, resulting from performing

physical exercise together, it is proposed that they will have higher values of received instrumental social support over time than those in the control group.

A3. Do individuals in the intervention group and control group differ in their received emotional social support?

Hypothesis A3: As individuals in the intervention group are more supported by their new exercise companion, due to encouragement and comfort, for example, it is proposed that they will have higher values of received emotional social support over time than those in the control group.

In part 2.3.2, the indirect and enabling effects of social support are described And it has been demonstrated that receiving social support may indirectly affect the targeted behaviour through the facilitation or the enabling of self-regulatory constructs and mechanisms, such as self-efficacy or action planning (e.g., Anderson et al., 2006; Benight & Bandura, 2004; Molloy et al., 2010). This intervention was to test the enabling effect on a broader basis by taking self-efficacy,self-monitoring, and action control into consideration . Additionally, these indirect effects would give further insight into embedding received social support in a comprehensive model of health behaviour, in this case the HAPA (Schwarzer, 2008). The working model for this research aim is shown in Figure 5.

An additional aim was to depict which type of social support (emotional and instrumental) is most predictive for self-efficacy, self-monitoring, and action planning. To the best of our knowledge, no study has yet tested the different contributions of instrumental and emotional social support on enabling physical exercise.

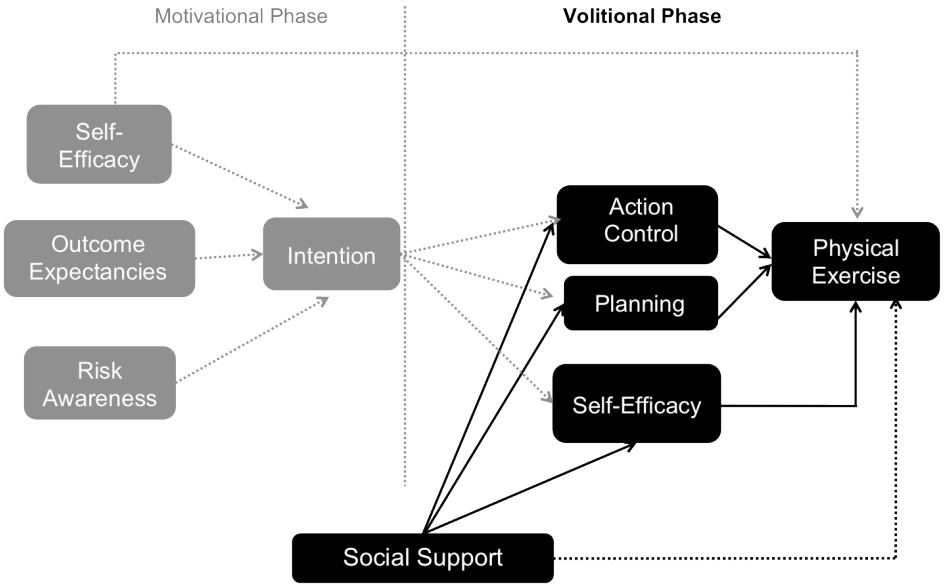


Figure 5. Working model for Chapter III (research questions B1 and B2), based on the HAPA (Schwarzer, 2008) with received social support included (Social Support)

Therefore, the following research questions are addressed:

B1. Is there an enabling effect of received social support on physical exercise through self-efficacy, self-regulation, and action planning?

Hypothesis B2: It is supposed that this effect is different for individuals in the intervention and control groups and that the enabling process would be stronger for individuals in the intervention group.

B2. Do received emotional and instrumental social support contribute differently to the enabling of physical exercise via self-efficacy, self-regulation, and action planning?

Hypothesis B2: This effect is assumed to be more pronounced for individuals in the intervention group than in the control group.

Answering these research questions contributes to the investigation of the processes under which circumstances and which kind of received social support is best to facilitate physical exercise. Also, the regulatory processes, which are associated with physical exercising, are investigated under the aspect of received social support.

The enabling effect of social support on exercising are extended by other self-regulatory constructs (self-regulation and action planning) than self-efficacy, in order to embed received social support in the volitional phase of the HAPA.

3.2. The contribution of need satisfaction for physical exercising

In Chapter I 2.3.3, the importance of the SDT for physical exercising and the assumed three basic needs were displayed. SDT (Ryan & Deci, 2004) has become an established framework for exploring motivational processes in exercise and helps to understand the motivational factors involved in exercise participation. In particular, the satisfaction of the three basic needs is important to engage in regular physical exercise (Ryan & Deci, 2007; Ryan, Williams, Patrick, & Deci, 2009; Vlachopoulos, Kaperoni, & Moustaka, 2011). Further investigating need satisfaction in physical exercise and how it can be utilized to support regular exercising requiresaccess to measures that fulfil psychometric requirements, such as factorial composition and internal consistency, and that are domain specific (Ryan, 1995; Vlachopoulos & Michailidou, 2004). Our aim, therefore, was to design a German scale to assess need satisfaction in exercise. The newly developed German scale is based on two other scales, which already exist in other languages (in Greek: Vlachopoulos & Michailidou, 2006; in English: Wilson, Rogers, Rodgers, & Wild, 2006). However, to the best of our knowledge, there is no translated and validated measure of need satisfaction in exercise in German, although need satisfaction is a core construct in SDT (Ryan & Deci, 2004). Thus, the aim of this study was to generate a reliable and valid German measure of need satisfaction in exercise. The following steps for scale construction are performed within this study:

C1. Translation of the Greek (Vlachopoulos & Michailidou, 2006) and English (Wilson et al., 2006) measures into German, followed by item selection for the final version.

C2. Examination of the factorial structure, testing the structure in two randomized split samples in order to replicate the factor structure, as well as with the same sample after nine months.

C3. Assessment of the internal consistency of the newly developed scale.

C4. Testing criterion validity. For this we reverted to a German scale that measures self-efficacy towards physical exercise (Fuchs & Schwarzer, 1994), and several motives for being engaged in exercise (Ryan, Frederick, Lepes, Rubio & Sheldon, 1997).

C5. Testing construct validity. For this we measured the participants' motivational style for exercise (Seelig & Fuchs, 2006), flow experience (Rheinberg et al., 2003), and well-being (Watson, Clark, & Tellegen, 1988).

A rationale for the selection of scales for the validation process will be presented in Chapter IV in more detail.

The availability of a validated German measure of need satisfaction in exercise is the first step in being able to apply this scale to health promotion and health interventions that target exercise behaviour. This also means that need satisfaction as a process that depends on a person's social context can be depicted adequately. Thus, with this scale, social context can be tested to evaluate whether it supports need satisfaction or not, and whether it could, in line with this, be changed to provide more or better need satisfaction in exercise situations.

4. Description of the Studies

In order to address the research questions described above, two studies were designed and conducted. Study 1 was specifically designed to answer research questions A1, A2, A3 and B1 and B2. The aim of Study 2 was to address research steps C1 to C5.

In the following, an overview of the two studies in terms of study design, samples, and recruitment procedures is presented. Detailed descriptions of sample characteristics and a complete method section per Study are given in Chapters II, III, and IV. Additionally, an overview of the studies and the respective chapters in this dissertation are presented in Figure 8.

4.1. Study 1. The interplay of received social support with physical exercising and with determinants of self-regulation: an intervention study

Study 1 was designed as a social support intervention with randomized allocation of the participants to either an intervention or control group. Both the intervention group and the control group received online questionnaires weekly. This intervention was designed to address research questions A1, A2, and A3 (detailed description in Chapter II), as well as research questions B1 and B2 (detailed description in Chapter III).

An overview of the recruitment procedure, the samples, and the study design is given in the following section. A detailed description of sample characteristics and a complete method section are presented in Chapters II and III.

Recruitment Procedure and Sample

The inclusion criterion for participating in Study 1 was the intention to begin or the intention to increase one's own physical exercise. This study was designed as a social-support intervention with randomized allocation of the participants to either an

intervention group or control group. The intervention group was instructed to search for a new exercise companion for the duration of the study (8 weeks). Received instrumental and emotional social support were to be addressed this way and utilized to enhance physical exercise on the part of the respondent. Both groups received a screening questionnaire (T0, either online-questionnaire or paper and pencil), where each participant could choose between three possible dates to begin the study. Thereafter, all participants received three online questionnaires in four-week intervals (T1, T2, and T3, see Figure 6). In addition, all participants received weekly monitoring online-questionnaires (M1 to M6, see Figure 6). As in incentive, individuals who answered all questionnaires received a 30 CHF voucher for an online book and media store after completing the study.

The actual recruitment mode was twofold. First, we recruited participants in two locations of a Swiss federal research institute. Paper and pencil questionnaires with two different instructions were randomly distributed among 35 people who wanted to enhance their physical exercise (n = 13 control group; n = 22 with intervention group instruction). Of these 35 questionnaires, 26 were returned (n= 6 control group, n = 20 intervention group). The second recruitment mode was distributing the link of an online questionnaire (with exactly the same content as the paper-pencil-questionnaire) through health-related websites, an advertisement in a university journal, and flyers to be displayed within group practices of a health insurance company. In doing so, we were able to reach 301 persons who clicked on the link of the screening questionnaire (see Chapter II for a participants' flow chart). By clicking on the link the participants were randomized to the intervention group (n = 150) or control group (n = 151). With regard to online recruitment, 104 participants (n = 55 control, n = 49 intervention group) did not provide their email address, which

means that we could not send a second questionnaire (T1) to the respective person and that he/she dropped out after T0. The participants' flow chart for both recruitment modes is displayed in Chapter II.

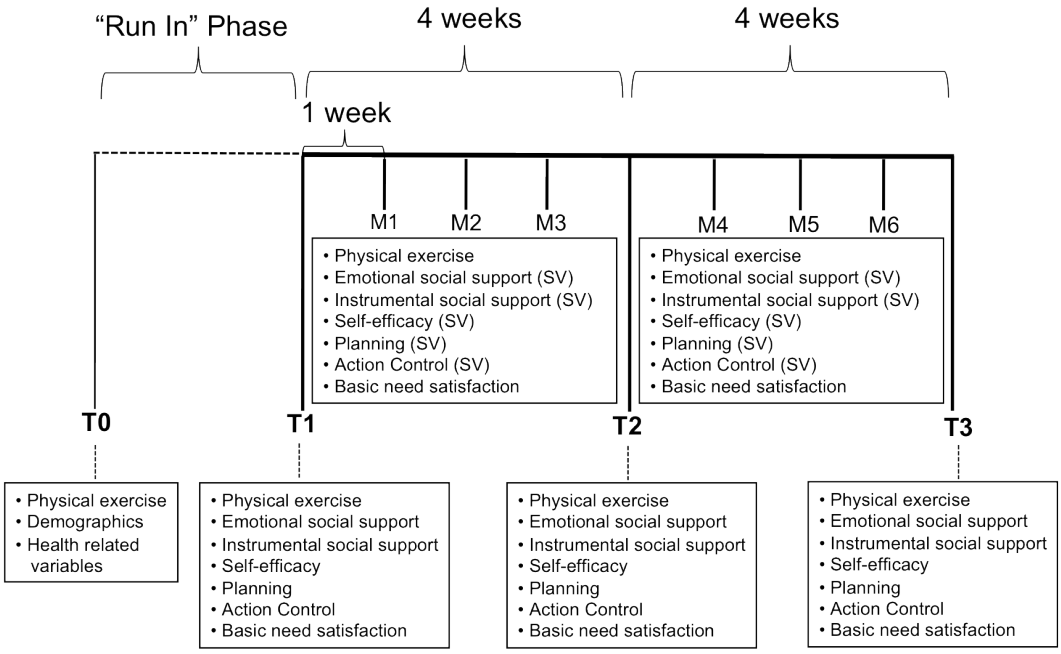


Figure 6. Study design of Study 1 and assessed variables and measures (SV = short version)

Design

This study is comprised of 10 measurement time points assessed by online-questionnaires. In the following, the variables assessed per measurement time point are described. At T0, the amount of physical exercise related to the past seven days, social demographic variables (e.g., age, family status, schooling etc.), and health related variables (e.g., height, weight, smoking status, fruit und vegetable consumption etc.) were assessed (see Figure 6). At T1, T2, and T3 again physical exercise related to the past seven days, received emotional and instrumental social support, self-efficacy, planning, action control as well as basic need satisfaction (separately measured for autonomy, competence, and social relatedness) were

measured. Additionally, all participants received online-questionnaires weekly, which are called “monitoring questionnaires” (M1 to M6). In the monitoring questionnaires, physical exercise related to the past seven days and basic need satisfaction were assessed. Moreover, short versions of the scales of received emotional and instrumental social support, self-efficacy, planning, and action control were administered.

4.2. Study 2: The German psychological need satisfaction in exercise scale – validation of a measure of need satisfaction in exercise

The aim of Study 2 was the translation, construction, and validation of a German measure to assess need satisfaction in exercise. With this measure, the research steps C1 to C5 mentioned above are addressed. An outline of the recruitment procedure, the sample and the study design are presented in the following section. This is outlined in more detail in Chapter IV.

Recruitment Procedure and Sample

A total of 654 people were recruited from one private fitness centre, different sport clubs, and the Academics Sports Association Zurich (ASVZ). This recruitment procedure assured the needed heterogeneity of participants and the type of sports participants practiced. At baseline (T1), participants filled out an online questionnaire. At the end of the questionnaire, the participnats could indicate whether they were interested in participating in a follow-up measurement point. If so, the participants could provide their e-mail addresses. After excluding participants who did not answer at least one of the need-satisfaction items, 614 persons remained in the sample (56.5% female, 1.8% did not indicate their gender). The participants’ age ranged from 16 to 81 years (M = 38.39 years, SD = 12.05 years). Half of the participants (52.45%) had a

high-school degree, 39.71 % got vocational training, and 458 (74.59%) reported to be employed.

Design

Nine months after T1, the second measurement (T2) took place and was completed by a total of 227 participants. After excluding those participants who did not answer at least one of the need-satisfaction items at T2, 216 persons remained in the retest sample. At both measurement time points, physical exercise, demographics, and the newly-developed scale "German psychological need satisfaction in exercise scale" (PNSEG) were measured (see Figure 7). Further information concerning the process of scale construction is presented in Chapter IV. Moreover, in order to test the criterion validity self-efficacy towards physical exercise (Fuchs & Schwarzer, 1994), and motives to exercise (Ryan, Frederick, Lepes, Rubio & Sheldon, 1997) were assessed at both measurement time points. To examine the construct validity of the PNSEG, the participants' motivational style for exercise (Seelig & Fuchs, 2006), flow experience (Rheinberg et al., 2003), and well-being (Watson, Clark, & Tellegen, 1988) were measured again at T1 and at T2 (see Figure 7).

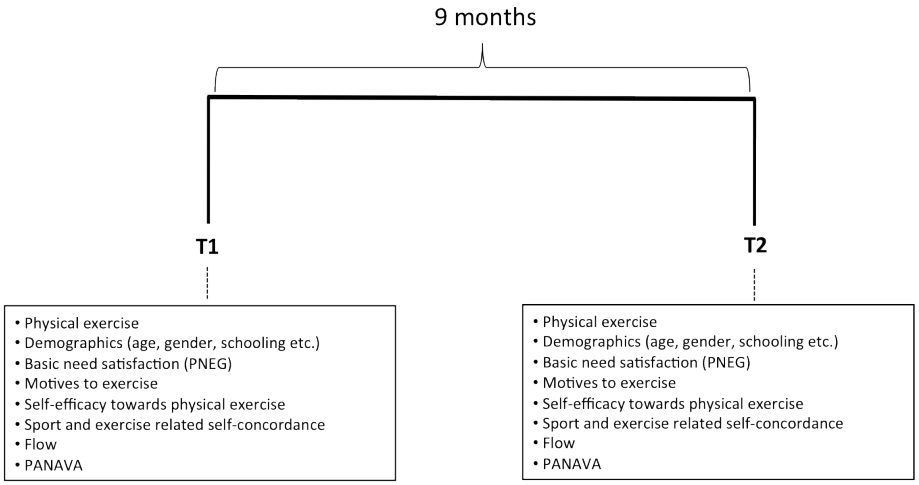


Figure 7. Study design of Study 2 and measures and variables assessed (PANAVA = Positive Activation (PA), Negative Activation (NA), and Valence (VA))

Dropout analyses revealed that there were no significant differences concerning age ($t(583) = 0.36$, $p = .72$), gender ($\chi^2(1) = 0.39$, $p = .72$), education ($\chi^2(8) = 9.12$, $p = .33$), employment ($\chi^2(1) = 1.05$, $p = .31$), exercise ($t(612) = -0.29$, $p = .77$), satisfaction of autonomy ($t(592) = -0.41$, $p = .68$), competence ($t(581) = -1.40$, $p = .99$), and relatedness $t(580) = -0.02$, $p = .16$) between the participants who completed both measurements and those who only completed T1.

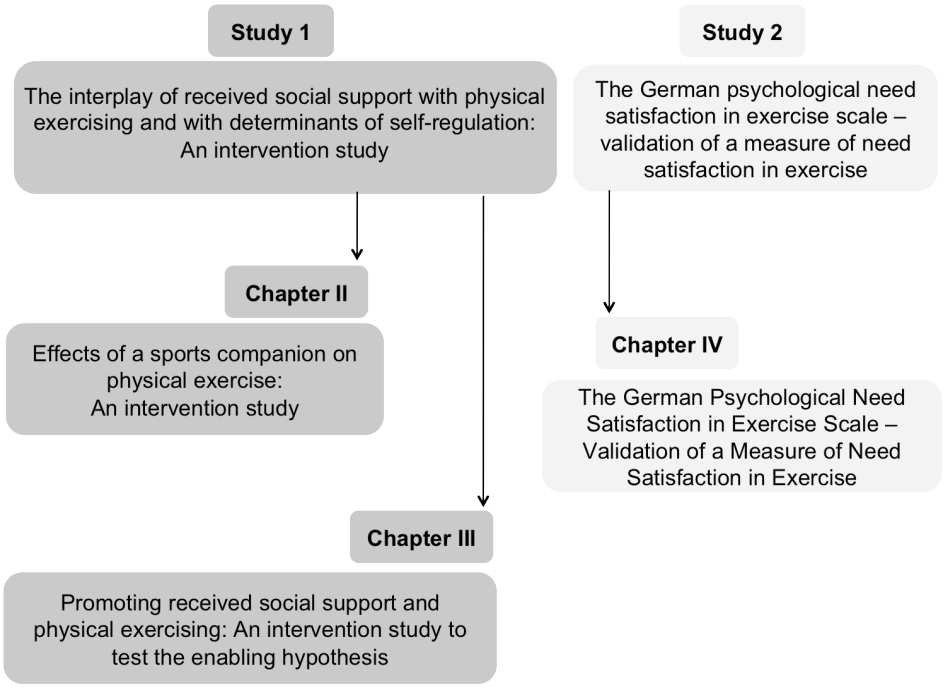


Figure 8. Overview of the studies and the respective chapters in this dissertation.

Chapter II

Effects of an exercise companion on physical exercise: An intervention study

Pamela Rackow, Urte Scholz, Falko F. Sniehotta, & Rainer Hornung

A similar version of this chapter is submitted for publication

Abstract

Objectives. The role of social support for physical exercising is well documented. However, the majority of studies that investigate the associations between social support and physical exercise target perceived instead of received social support. Moreover, most studies investigate the effects of received social support in a descriptive correlational. Thus, our study aimed at investigating the effects of received social support by conducting an intervention study.

Methods. Participants were randomly assigned to an intervention or control group. The intervention comprised regularly exercising with a new sports companion for eight weeks. To investigate the time course of physical exercising and received social support, growth curve modelling was employed.

Results. Both groups were able to improve their physical exercising for the time of the study. Received social support, however, decreased slightly in the control group, but remained stable in the intervention group.

Conclusions. The intervention was suitable to sustain received social support for physical exercise across a two-months interval. However, the control as well as invention group were able to enhance their physical exercising. These finding suggests on the one hand the need to further investigate other possible social determinants of physical exercising, and on the other hand the possibility of different pathways and mechanisms of received social support and physical exercising.

Keywords: received social support; exercising; growth curve model; intervention

Introduction

In most western industrialized countries, adults lead a sedentary lifestyle (Hardman & Stensel, 2003). This is although regular exercise is important to obtain and keep physical and psychological health (Cavill, Kahlmeier, & Racioppi, 2006). Thus, it is important to identify effective strategies to enhance physical exercise among sedentary adults. One can distinguish between strategies that mainly focus on the person itself, like self-regulation abilities (e.g., Gollwitzer & Sheeran, 2006), and strategies that focus on the person's environmental and social context, such as social support. The latter, however, has been mostly examined in studies applying correlational designs (e.g., van Straalen, De Vries, Mudde, Bolman, & Lechner, 2009), which excludes causal inferences on this particular association. This study set out to contribute to the question of causality between received social support and physical exercise by using an experimental approach.

Social support for physical activity

Social support can be differentiated into perceived social support and received social support (cf. Uchino, 2009). *Perceived* social support refers to the anticipation of potential help from the social network. *Received* social support is the support one receives when needed (Uchino, 2009). Although not a measure of actual support transactions, it is still more common to investigate perceived than received social support (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007). Several types or functions of social support can be distinguished like emotional, instrumental, and informational social support (Schwarzer & Knoll, 2007). Emotional social support refers to the emotional well-being of the recipient and covers aspects like encouragement and comfort. Instrumental social support refers to supporting the recipient by means of assisting with the problem or donating goods

(Schwarzer & Knoll, 2010). Finally, informational social support covers functions like providing relevant information and giving advice (Schulz & Schwarzer, 2003; Schwarzer & Knoll, 2007).

The social support of important others (e.g., family and friends) can play a crucial role in the adoption and maintenance of physical activity and exercise (Courneya, Plotnikoff, Hotz, & Birkett, 2000; Lippke, 2004; Trost, Owen, Bauman, Sallis, & Brown, 2002; Spanier & Allison, 2001). In a meta-analysis, Carron, Hausenblas, and Mack (1996) identified family support and support of important others as important factors for exercise adherence behaviour. In their literature review on determinants for initiation and maintenance of physical activity among older adults, van Straalen, De Vries, Mudde, Bolman, and Lechner (2009) identified social support from significant others and having a sports partner as positively associated with the initiation of physical activity. In terms of maintaining physical activity, positively associations for being supported by group members and sport partners were found as well. In terms of instrumental and emotional social support, several studies showed associations between both types of social support and physical activity engagement (Fischer Aggarwal, Liao, and Mosca, 2008), and physical activity maintenance (Kouvonen et al., 2011).

One facet of instrumental social support is concrete assistance. With regard to exercising a number of studies reported positive associations between having someone to exercise with (e.g., having an exercise companion) and physical exercise levels (cf. Brehm & Eberhardt, 1995; Dunton et al., 2009; Gellert, Ziegelmann, Warner, & Schwarzer, 2011; Giles-Corti & Donovan, 2002) as well as exercise adherence (e.g., Brehm & Eberhardt, 1995; Oka, King, & Young, 1995).

However, some important issues have not yet been covered by the presented studies. Most of the reported studies have addressed perceived social support, but only a few have focused on received social support (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll, Rieckmann, & Kienle, 2007). Even fewer studies have dealt with the support received from a sports companion. Moreover, if studies took this source of social support into account, then the investigated sample made use of sports companions they already exercised with for a longer period of time. In doing so, the potential consequences and effects of exercising together cannot be investigated appropriately, because both partners are already a well-rehearsed team.

Aim of the present study

If interventions want to make use of social support as an intervention strategy, then there are two indispensable objectives: first, to investigate *if*, and second also to further investigate *how* social support works. Thus, our study aimed at exploring the effects of received instrumental and emotional social support on exercising by conduction a randomized intervention study.

Method

Intervention procedure and recruitment modes

The intention to begin or to increase one's own physical exercise was the inclusion criteria for participating in our study. In our study, we conducted a social support intervention, which comprises finding a new sports companion and exercising together for eight weeks. Received instrumental and emotional social support should be addressed this way and utilized to enhance physical exercise on the part of the respondent. In line with the work of Abraham and Michie (2008), social support can be categorized as a behaviour change technique. The control group did not receive such an instruction. Both groups received a screening questionnaire (T0, either online-

questionnaire or paper and pencil), where each participant could choose between three possible dates to begin the study. Afterwards, the participants received three online questionnaires in four-week intervals (T1, T2, and T3). Participants who answered all questionnaires received an incentive (30 CHF voucher for an online book and media store) after completing the study.

The recruitment mode was twofold. First, we recruited participants in two locations of a Swiss federal research institute. Paper and pencil questionnaires with two different instructions were randomly distributed among thirty-five people who wanted to enhance their physical exercise (n = 13 control group; n = 22 with intervention group instruction). Of these 35 questionnaires, 26 were returned (n= 6 control group, n = 20 intervention group). The second recruitment mode was distributing the link of an online questionnaire (with exactly the same content as the paper-pencil-questionnaire) via health-related websites, an advertisement in a university journal, and flyers for display within group practices of a health insurance company. In doing so, we were able to reach 301 persons who clicked on the link of the screening questionnaire (see Figure 9). By clicking on the link the participants were randomized to the intervention (n = 150) or control group (n = 151). Additionally, participants could choose between three dates to begin with the study. Altogether, 104 participants (n = 55 control, n = 49 intervention group) did not provide their email address, which means that we could not send a second questionnaire (T1) to the respective person again and that he or she dropped out already after T0. The participants' flow is displayed in Figure 9.

Participants

In the control group as well as in the intervention group, participants' mean age was around 35 years. In both groups, most participants were female (see Table 1).

At T0 participants in the control group as well as in the intervention group reported to exercise between 150 and 160 minutes in the past seven days. In both groups, nearly half of the participants reported to work full time, and a good third reported to be college/university students (Table 1). A full and detailed description of the baseline characteristics of the 223 participants who underwent randomisation and answered at least the T0 questionnaire is shown in Table 1. There are no significant differences between the two study groups in any of these measures. Thus, the randomization was successful.

Table 1

Descriptive statistics of the baseline questionnaire (T0) displayed separately for intervention and control group.

Variable	**Control (n = 102)**	**Intervention (n = 121)**
Female	62.75 %	65.53%
Age (years)	34.45 (11.00)	34.66 (11.11)
Physical Exercise (Minutes of exercising in the past 7 days)	146.28 (139.12)	160.95 (129.05)
Work		
Student	32.35 %	33.88 %
Unemployed	0.98 %	5.79 %
Full time work (more than 32 hours per week)	51.96 %	52.07 %
Family status		
Married/living with partner	36.27 %	41.32 %
Single/divorced	47.08 %	41.32 %
Education		
High school degree	48.03 %	57.02 %
Health related variables		
Height (cm)	169.34	170.07
Weight (kg)	69.42	65.04
Portions Fruit/Veg. per day	2.79 (1.29)	2.72 (1.25)
Smoking "yes"[1]	10.30 %	13.30 %
Weekly Alcohol Consumption "yes"[2]	34.31%	33.88 %

Note. [1] This information refers to the question "Do you smoke – even if rarely"; [2] This means alcohol consumption in general at least once a week.

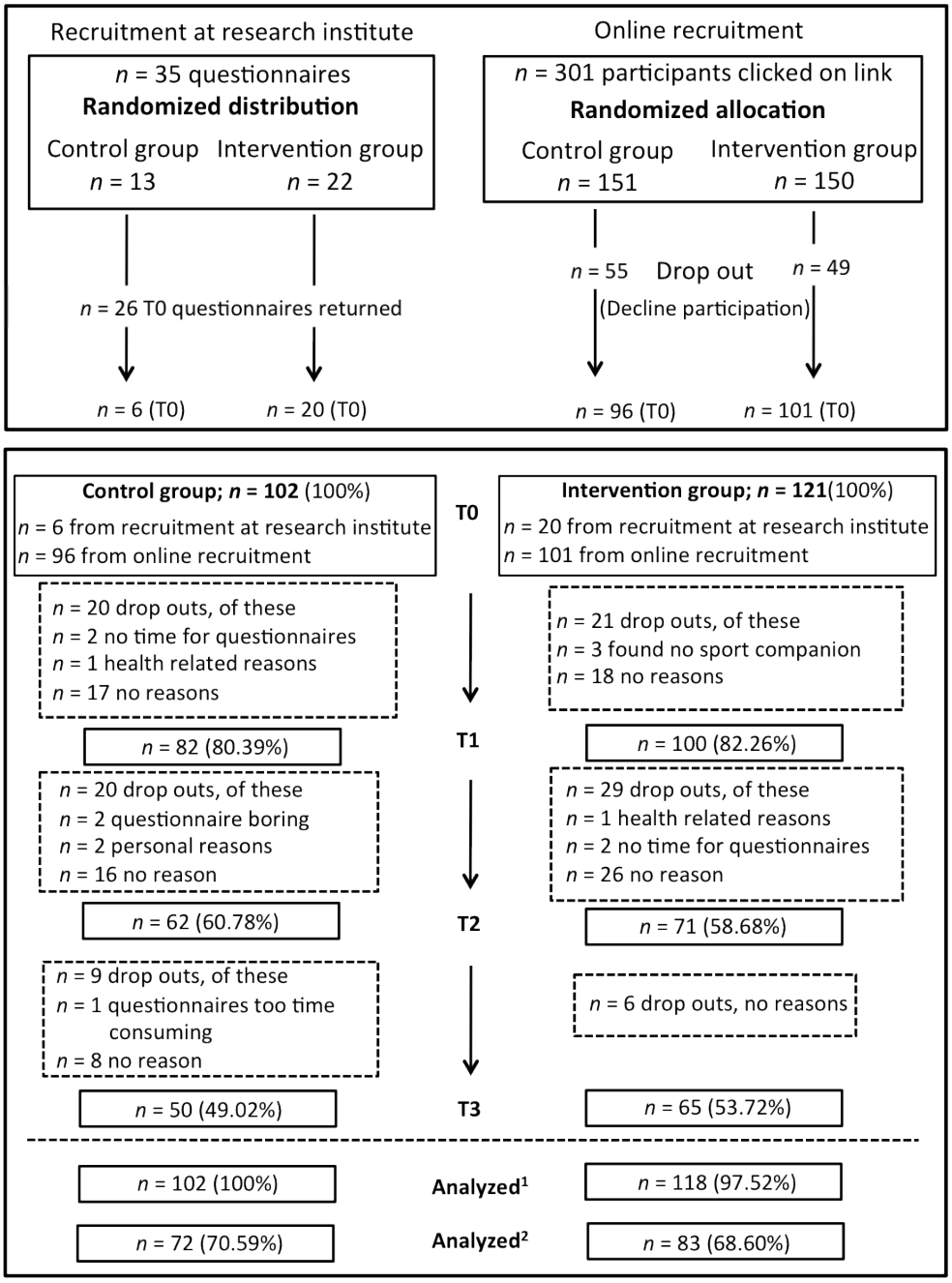


Figure 9. Flow of participants. Upper level represents the two different recruitment modes at the research institute and via the online-questionnaire. Lower level displays the flow of participants. Three individuals in the intervention group reported that they did not find a sports companion and were therefore excluded form all imputation procedures and the analyses. Analyzed[1] refers to the participants imputed and analyzed for the growth curve model for physical exercise. Analyzed[2] refers to the participants imputed and analyzed for the growth curve models for emotional and instrumental social support.

Measures

The socio-demographic and health related variables were assessed at T0. Physical exercising was measured at T0, T1, T2 and T3. Received instrumental and emotional social support were assessed at T1, T2, and T3. The sample means of the respective constructs are reported below. The group means for all variables are reported in Table 2.

Table 2

Means (standard deviations) of physical exercise and the psychological variable under study in intervention and control group for all measurement time points

Variable	Group	T0	T1	T2	T3
Physical Exercise*	Control	146.28 (139.12)	166.90 (168.76)	218.91 (147.35)	172.60 (177.28)
	Intervention	160.95 (129.05)	184.48 (141.17)	204.71 (152.13)	266.50 (246.73)
Emotional Support	Control	--	5.26 (1.36)	4.79 (1.34)	4.59 (1.45)
	Intervention	--	5.22 (1.26)	5.06 (1.10)	4.98 (1.40)
Instrumental Support	Control	--	4.26 (1.52)	3.87 (1.56)	3.76 (1.76)
	Intervention	--	4.79 (1.37)	4.63 (1.33)	4.63 (1.62)

Note. *Minutes of exercising in the past 7 days; Control group: n = 102; Intervention group: n = 121

Physical exercise. Vigorous physical exercise at all measurement points was assessed by one item of the International Physical Activity Questionnaire (IPAQ; Booth, 2000). Participants were asked to indicate how often during the past seven days they had engaged in vigorous physical activities, such as jogging, swimming or weight lifting. Additionally, they indicated how much time they usually spent performing those activities per exercise occasion. Frequency and average duration per exercise occasion were then multiplied in order to obtain a measure of weighted

duration for the past seven days. The IPAQ has admissible validity values when comparing with accelerometer data (Craig et al., 2003). Data cleaning and handling followed the guidelines for use of the IPAQ (The IPAQ Group, 2005). At T0 all participants exercised on average 155.60 minutes per week (*SD* = 159.77 minutes). At T1, they exercised on average 183.81 minutes per week (*SD* = 160.66), at T2 it were 211.44 minutes per week (*SD* = 189.84), and at T3, the participants exercised on average 224.15 minutes per week (*SD* = 219.16).

Received emotional social support. To determine the degree to which participants feel emotionally supported by their exercise companion at T1, the subscale emotional social support of the Berlin Social Support Scale (Schulz & Schwarzer, 2003) was adapted to the context of physical exercise. It comprises five items, for example "This person comforted me with regard to my physical exercise". Response range was from 1 = "not at all true" to 6 = "exactly true". The item wording was equal for intervention and control group. However, the item introduction was slightly different for both groups. In the intervention group, the participants were asked to think at their new exercise companion when answering the items. In the control group, participants should have someone in mind with whom they have been exercising on a regular or irregular base. Time 1 emotional social support had a sample mean of 5.26 (*SD* = 1.29) and Cronbach′s α = .86. Time 2 emotional social support had a sample mean of 4.93 (*SD* = 1.23; Cronbach′s α = .85), and Time 3 emotional social support had a sample mean of 4.79 (*SD* = 1.43; Cronbach′s α = .87).

Received instrumental social support was also assessed by a context-adapted version of the corresponding subscale of the Berlin Social Support Scale (Schulz & Schwarzer, 2003). It comprises seven items, for example "This person offered me his/her help to maintain my physical exercise". The item wording and introduction

were given in the same way as reported for received emotional social support. Having the same response range as emotional social support, Time 1 instrumental social support had a sample mean of 4.58 (*SD* = 1.48) and Cronbach′s α = .90. At time 2 instrumental social support had a sample mean of 4.25 (*SD* = 1.44; Cronbach′s α = .93), and Time 3 instrumental social support had a sample mean of 4.19 (*SD* = 1.69; Cronbach′s α = .94).

Data analysis

Descriptive statistics, scale values, and Cronbach′s alphas were computed with SPSS 18. Missing data were treated using the multiple imputation (MI) function of SPSS (SPSS. 2009). In so doing and in the sense of an intention to treat analyses, all participants who filled in at least T0 and fulfilled the including criteria remain in the analyses. Three individuals in the intervention group reported that they did not find a sports companion and were therefore excluded form all imputation procedures and the analyses. When comparing MI with others types of missing data handling (e.g., mean substitution, averaging available items, see Schafer & Graham, 2002 for a survey of methods), the advantage of the MI procedure is the generation of error variance in the sense of random noise. MI accounts for missing data uncertainty by creating multiple values for the missing data point, by creating several data-sets, and by adding between-imputation variance. In contrast, regression based single imputation procedures lead to imputed values that lie right on the regression line and thus, this does not represent real data (Graham, 2009). For the present study MI was conducted separately for physical exercising and for received social support and because of this the number of analyzed individuals for physical exercising and for received social support differ (Figure 9). We choose this approach, because we wanted to ensure that the analyzed sample for received social support comprises individuals who at least

answered these items once. Finally, five data sets for each sample were generated and analysed. To calculate the progress of physical exercise and received social support over the time of study, growth curve modelling was employed. The shape of the growth curve for all models was defined a priori as linear and according to this the loadings were fixed with 0,1,2,3 for physical exercise (four measurement time-points), and respectively with 0,1,2 for received instrumental and emotional social support (three measurement time-points) (e.g., Geiser, 2010). The growth curve models for received instrumental and emotional social support are composed of three measurement points, and no restrictions that reduce the number parameters for the mean- structure were applied. Thus, these models are saturated and for this no model fit indices will be reported for received instrumental and emotional social support (Geiser, 2010). Whereas, the growth curve model for physical activity is composed of four measurement time points. Therefore the following goodness-of-fit indices are reported for the growth curve model of physical exercise. The χ^2 goodness-of-fit statistics describe the magnitude of discrepancy between the sample and the fitted covariance matrix (Hu & Bentler, 1999). Additionally the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI) are utilized. They are incremental fit indices, which compare the fit of the target model with the baseline-model (Geiser, 2010). Acceptable fit is indicated by values greater than .90 (Hu & Bentler, 1999). The Root-Mean-Square-Error-of-Approximation (RMSEA) measures the approximate datafit of the model is important to evaluate the residuals and should be lower than .05 (Geiser, 2010). All models were calculated with M*plus* 6.1 (Muthén & Muthén, 2010). To compare the control and intervention group multigroup modelling was applied (Hoyle, 2011).

Results

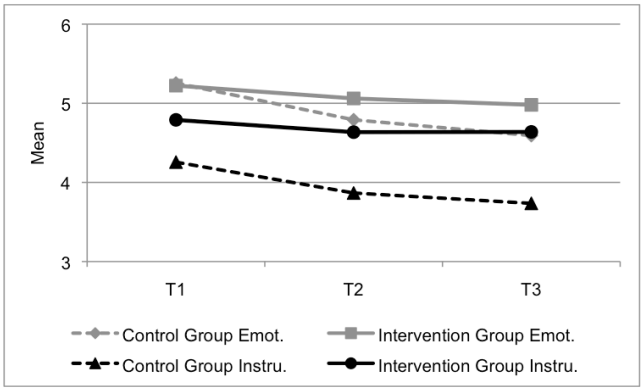
Descriptives

By visual inspection of the data, it seems that participants in the intervention as well as the control group were able to improve their physical exercising during the time of study (Table 2). More precise, it seems that, both groups increased their physical exercising from T0 to T2. A different picture emerges when inspecting the development from T2 to T3.There is a tendency that participants in the intervention group could increase their physical exercising in that period of time, whereas it seems that the physical exercising of the participants in the control group decreased (see Figure 10). When inspecting the time course of received emotional and instrumental social support, it seems that there is a slight decrease within both groups. This tendency, however, seems to be more pronounced in the control group (see Figure 10). At T1, there are significant differences in received instrumental social support between control and intervention group ($t(153) = 2.24$, $p = .03$, $d = 0.36$). The participants in the intervention group reported to receive more instrumental social support. Whereas, concerning emotional social support, there were no significant differences between the groups at T1 ($t(153) = -0.19$, $p = .85$; $d = 0.03$).

Time course of physical exercise and received social support

To find out whether the above-described trends are significant, latent growth curve modelling was employed.

The interindividual change of physical exercise over time is displayed at the slope factor of the respective model. For the intervention group ($M_{linear} = 24.38$, $z = 2.92$, $p = .01$) as well as for the control group ($M_{linear} = 25.62$, $z = 2.83$, $p = .01$) the slope factor is significant, which means that physical exercise has changed over time in that physical exercise in both groups has significantly increased.



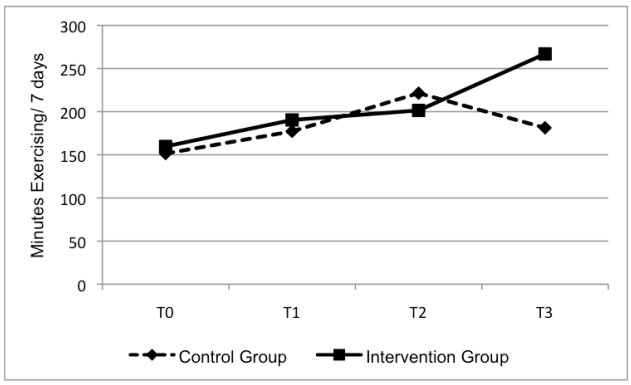


Figure 10. Upper panel: Time course of received emotional and instrumental social support for intervention and control group (based on multi imputed data).
Lower panel: Time course of physical exercise for intervention and control group (based on multi imputed data).

A second function of latent growth curve models is to estimate interindividual differences in intraindividual changes. Significant variance in the slope factor represents interindividual variability in the change of physical exercise over time (Legge, Davidov, & Schmidt, 2008). In our case, there is no interindividual variability in the change of physical exercise over time, neither for the intervention group (Var_{linear} = 555.91, z = 0.51, p = .61), nor for the control group (Var_{linear} = 2225.44, z = 1.46, p = .15). The model-fit can be considered as satisfying (χ^2 = 10.34, df = 10, p = .41; *TLI* = .99*; CFI* = .99; *RMSEA* = .02, 90% *CI* from .00 to .11).

With regard to change in social support, there is significant change over time of received emotional social support in the control group (M_{linear} = - 0.29, z = -3.56, p < .001), but not in the intervention group (M_{linear} = -0.12, z = -1.56, p = .12). The received emotional social support in the control group significantly decreased over time. Again, there is no interindividual variability in the change of received emotional social support over time in both groups (intervention group: Var_{linear} = .05, z = 0.37, p

= .71; control group: Var_{linear} = 0.22, z = 1.01, p = .31). With regard to received instrumental social support the pattern is very similar. There is significant change over time of received instrumental social support in the control group (M_{linear} = -0.25, z = -1.98, p = .04), but not in the intervention group (M_{linear} = -0.09, z = -0.87, p = .38). Once more, the received instrumental social support in the control group decreased over the time of study. Moreover, there is no interindividual variability in the change of received instrumental social support over time in both groups (intervention group: Var_{linear} = 0.22, z = 1.20, p = .23; control group: Var_{linear} = 0.14, z = 0.39, p = .69*).* In other words, there are no differences in the development of received instrumental social support within the two groups over time. Both models are saturated.

Discussion

The present study investigated the effect of having a new sport companion for enhancing physical exercising. Moreover, it was tested whether this also enhanced received emotional and instrumental social support. This study was designed as an intervention study with randomized allocation of the participants to intervention and control group. With regard to exercising, both groups were able to improve their physical exercising during the time of study. Received emotional social support remained stable in the intervention group, but significantly decreased in the control group. The results for instrumental social support show the same pattern: Only in the control group, received instrumental social support significantly decreased over time. We did not expect this kind of time course for instrumental nor for emotional social support. Instead, we expected that in the intervention group the received instrumental social support might increase at the beginning of the study, and would remain stable until the end of the study, because every exercising dyad had found its modus operandi. In contrast, for the control group, we expected the received instrumental

social support to remain stable on a low level for the time of the study, because the control group was not instructed to search for a new sports companion. However, it seems that having a new sports companion ensures the maintenance of receiving social support. One possible reason for this result could be that the boosting effect of receiving social support took place in the phase when the participant and his/her sports companion began to make plans about their new exercising behaviour. It is highly likely that this happened in the time period between the questionnaires T0 and T1 when the randomized allocation to the two groups took place and participants in the intervention group had the task to find a new sports companion. However, we did not collect data in this time period. The next measurement was at T1. At that time, the sports companions already exercised together, meaning that participants of the intervention group already received instrumental and emotional social support. Thus, future research should try to capture the received social support in the phase when the sports companions congregate, e.g., by applying a daily diary design during this critical period.

Moreover, the assumption of a boosting effect for received social support between T0 and T1 for the intervention group is also supported because there was a significant difference between intervention and control group in T1 instrumental social support. When the two new sports companions have begun to make plans respectively when the participant found his/her new sports companion, then especially the instrumental social support raises, because instrumental social support covers the functional and tangible aspects of received social support. To revisit the above-mentioned topic of the best time point for assessing social support for the first time, one could strike on the idea to already assess it at T0 would be good in order to compare with the T1 results. For the assessment of received social support in the

control group, this would have been possible, because those participants were asked to report the received social support provided by a person they already exercised with regardless of on a regular or irregular base. However, we were especially interested in the impact of a *new* sports companion on physical exercise. Therefore participants in the intervention group got the task to find a new sports companion for the time of study. This also means that at T0 for the participants in the intervention group the source of the received social support for physical exercise was still non-existent. Another possibility would have been to ask the participants at T0 about the expected social support from the sports companion, but this kind of social support would not have been congruent with the received social support at the time points T1 to T3. Thus, these answers would not be comparable with the answers participants provided when they actually have exercised with their respective sports companion.

Some limitations of the present study need to be addressed. Our sample was already very active at the beginning of the study. Thus, there was only small room for improvement. Future studies should therefore focus on participants with lower exercise levels at the beginning in order to have greater potential for change. Another limitation is the high dropout rates between the first (T0) and second (T1) points of measurement. The fact, however, that the number of participants who declined participation is equal in the control and in the intervention group indicates that the dropout might not be due to the condition of searching for a news sports companion, but to other reasons. When taking a closer look at the dropout rates from T1 to T3, we again lost nearly half of our participants in both groups. On the one hand, this is a well-documented problem in longitudinal studies and this is the reason why we decided to offer incentives for regular participation. On the other hand we

compensated these high dropout rates by using an appropriate method of missing imputation (Graham, 2009).

Our participants were free to choose their sports companion as long as this companion remains the same person during the eight weeks of the intervention. Thus, the source of social support in terms of the function for the respective person was different for each and every participant. That means some of our participants exercised with their spouse, others with their best friend, or with their colleague. From other studies we know that the source of social support is associated with the support quality. For example, in their meta-analysis, Carron et al. (1996) demonstrated that spousal support is very effective when the physical exercise the target person performs is externally motivated, such as recommended by a health professional. Whereas, when the target person wants to maintain his/her exercise behaviour by own initiative, important others in terms of friends and colleagues are more important than family support. Additionally, van Stralen et al. (2009) found in their literature review on physical activity determinants in older adults that family social support is especially important when the target person wants to begin with being physical active. Whereas, when the target person wants to maintain his/her physical activity, the support of health care providers, sport instructors and exercise group members seems to be the better predictor for future physical activity. Hence, it is of importance to investigate the different facets of different sources of support, and under which circumstances and whose support is best for physical exercising. There are for example several advantages and disadvantages of the spouse being the sports companion. On the one hand, the chance is higher that this person is better available for possible physical activities compared to a friend or a working colleague. From commentaries of our participants, we know that one main reason for not exercising together as indented

was lack of time. Other frequently reported reasons to choose someone as a new exercise companion were for example living in the same place and conditions concerning for instance having the same schedule. All in all, the reported reasons would rather speak in favour to choose the spouse an exercise companion. But, on the other hand, if someone usually does a lot of leisure time activities with his/her spouse anyway, it might be *too* much shared activities. Especially when taking into account that one person has the desire to enhance physical exercising, then this person might experience the shared physical activity as too controlling or might get the impression of losing his/her autonomy. Thus, this would speak in favour of finding someone else but the spouse as exercise companion. Indeed, finding someone else than the spouse can be associated with other challenges. For example, finding a person that is willing to exercise with the target person at all: or finding an appointment that suits for both; etc. These issues should be addressed in future research. Besides the impact of the social support provider, the further investigation of the kind of sports both companions engage in would be of importance. It might be that some kinds of sport are better suited for this kind of interventions.

Another important issue, which has not yet been addressed in our study, is the dyadic perspective. We only collected data form the recipient of the social support and not from the supporting person. Collecting data from both parts of the exercising dyad would provide insights into the supporting process per se. That means, that possible mechanisms could be investigated more precisely.

Conclusions

This study is, to our knowledge, among the first that applied an experimental approach to investigate the effects of received social support on exercising. The intervention was suitable to sustain received social support for physical exercise

across a two-months interval. However, the control as well as invention group were able to enhance their physical exercising. These finding suggests on the one hand the need to further investigate other possible social determinants of physical exercising, and on the other hand the possibility of different pathways and mechanisms of received social support and physical exercising.

Chapter III

Promoting received social support and health behaviour: An intervention study to test the enabling hypothesis

Pamela Rackow, Urte Scholz, & Rainer Hornung

A similar version of this chapter is submitted for publication

Abstract

Objectives. Received social support is considered to be of importance for health enhancing physical exercise participation. Previous research provided evidence for the direct path from received social support to physical exercising as well as for the indirect path, mediated by constructs of self-regulation, like for example self-efficacy. Benight and Bandura (2004) labelled this indirect effect "enabling hypothesis". This study set out to examine the enabling effects of received social support on self-efficacy. Moreover, it aimed at expanding the enabling hypothesis by investigating the mediating effects of self-monitoring and action planning on physical exercising as well. Further, the contribution of different kinds of received social support (emotional and instrumental) was also investigated.

Methods. An 8-week experimental online-study was conducted. Participants were randomly assigned to an intervention or a control group. The intervention comprised finding and exercising regularly with a new exercise companion. Intervention and control group effects were compared by a manifest multi-group model.

Results. In the intervention, but not in the control group, received emotional social support predicted self-efficacy, self-monitoring, and action planning. Moreover, received emotional social support was indirectly connected with physical exercise via all examined mediators. No direct or indirect effect of received instrumental social support on physical exercise emerged. In the control group, instrumental social support was neither associated with self-efficacy, self-monitoring, and action planning, nor with physical exercise.

Conclusion. Actively looking for an exercise companion and exercising together seems beneficial for the promotion of received emotional social support as well as for self-efficacy, self-monitoring, action planning, and exercise behaviour.

Keywords: Receives social support, intervention, enabling hypothesis, exercise

Introduction

Leading an active lifestyle in terms of exercising on a regular basis is important to stay healthy (Cavill, Kahlmeier, & Racioppi, 2006). Despite all advantages of an active lifestyle, however, most adults in western industrialized countries lead a sedentary lifestyle (Hardman & Stensel, 2003).

To change this certainty, many theories and theoretical constructs try to explain behaviour and behaviour change, especially in the field of the adoption and maintenance of health behaviour. One important construct within the field of health psychology is self-efficacy. Self-efficacy can be described as a person's perceived ability to master arising demands or barriers successfully (Bandura, 1986, 1989), and it is important in every phase of the behaviour change process (e.g., Scholz, Sniehotta, & Schwarzer, 2005). Self-efficacy is part of Bandura's social cognitive theory (SCT; 1986; 1989). SCT is a "model of reciprocal causation" (Bandura; 1989, p. 1175), in which cognitive, affective, personal, and environmental factors all act as interacting determinants. Besides self-efficacy, self-regulatory strategies, such as self-monitoring, are described within SCT as well (see Bandura, 1991). Self-regulation can be defined as any kind of effort an individual undertakes to change a certain kind of behaviour or action (e.g., Carver & Scheier, 1998). It is important for behaviour change processes because it facilitates initiation and maintenance of a certain behaviour by preparing and controlling performance (Burkert, Scholz, Gralla, Roigas, & Knoll, 2011). Self-monitoring is one strategy to self-regulate a certain behaviour. If individuals for example want to engage in physical exercising three times a week, they need to monitor themselves in order to evaluate if the performed actions correspond with the intended goal. Self-monitoring has been indentified as an important and powerful behaviour change technique (Abraham & Michie, 2008). Moreover, formulating simple plans of when, where and how to change a certain behaviour is another self-regulative strategy that helps to

adopt a new behaviour. It is called action planning (Leventhal, Singer, & Jones, 1965), and it is comparable with the concept of implementation intentions (Gollwitzer, 1999).

However, the constructs described above mainly represent cognitive factors of the process of health behaviour change. Besides these factors, social or environmental factors (e.g., social support) play an important role within the SCT (Bandura, 2000) as well as in the field of health behaviour change (for exercise behaviour see Carron, Hausenblas, & Meck, 1996).

Social support

Social support can broadly be defined, as any kind of behaviour that supports an individual in achieving desired goals or outcomes (Caplan, Robinson, French, Caldwell, & Shinn, 1976; Duncan, Duncan, & Strycker, 2005; Taylor, Baranowski, & Sallis, 1994). Several types or functions of social support can be distinguished like emotional, instrumental, and informational social support (Schwarzer & Knoll, 2007). Emotional social support refers to the emotional well-being of the recipient and covers aspects like encouragement and comfort. Instrumental social support refers to supporting the recipient by means of assisting with the problem or donating goods (Schwarzer & Knoll, 2010). Moreover, social support can be differentiated into perceived social support and received social support as well (cf. Uchino, 2009). *Perceived* social support refers to the perception of potential help from the network, and *received* social support is the concrete support one receives when actually needed (Uchino, 2009).

Social support for physical activity

The social support of important others (e.g., family and friends) can play a crucial role in the adoption and maintenance of physical activity and exercise (Courneya, Plotnikoff, Hotz, & Birkett, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002). For example, Spanier and Allison (2001) demonstrated that general social support in terms of the frequency and the

quality of having contact with important others was associated with higher levels of physical activity. Results from a study by Giles-Corti and Donovan (2002) showed that the greater the number of important others who exercised regularly with the respondent the more likely recommended levels of physical activity were achieved. Likewise, Gellert, Ziegelmann, Warner, and Schwarzer (2011) implemented a health promotion program for older adults and found out that those participants who experienced social support and whose partner were also actively involved in the program, could increase their physical activity over time. Moreover, Lippke (2004) demonstrated that social support helped participants of a rehabilitation treatment increasing their exercise frequency.

The results reported above provided evidence for the direct effect of social support on physical activity. Indeed, there is a growing body of literature (e.g., Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993; McAuley et al., 2003; Molloy, Dixon, Hamer, & Sniehotta, 2010; Wojcik, Winett, & Williams, 2006) that investigates mediators of the path from social support to physical activity in order to explain the psychological mechanisms through which social support effects health behaviour. Benight and Bandura (2004) have found in studies on recovery from traumatic stress that social support enhanced self-efficacy and this in turn facilitated recovering from the stressful event. They labelled this mechanism “enabling effect”. In the domain of physical activity and exercising, McAuley and colleagues (2003) demonstrated a similar effect of influencing exercise behaviour via the mediation of self-efficacy (see also Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993). This pathway from social support to physical activity via self-efficacy has also been extended by other self-regulatory mechanisms. On the basis of SCT, Anderson, Wojcik, Winett, and Williams (2006) demonstrated that social support directly influenced self-efficacy and self-regulation. Furthermore, self-regulation was also indirectly affected by social support via self-efficacy. In turn, self-efficacy and self-regulation predicted

physical activity. Furthermore, in recent studies, planning was found to be a mediator of the association between social support and physical activity as well (Molloy, Dixon, Hamer, & Sniehotta, 2010). Moreover, some studies also addressed the question if receiving social support in terms of making plans together with someone else as a self-regulatory strategy might help to accomplish targeted health behaviour. Prestwich and colleagues (2005) labelled this approach collaborative implementation intentions and found higher levels of breast self-examinations (BSE) rates in women who planed to perform BSE together with their partner. Similarly, Burkert and colleagues (2011) instructed their participants (prostatectomy-patients) to plan together with their partner the performance of pelvic-floor exercise. However, there were no specific intervention effects. To conclude, these inconsistent findings need to be further investigated.

Aims of the present study

To the best of our knowledge, the effects of exercising together have not yet been investigated within an experimental approach. Usually the participants in the reported studies reverted to persons they were already exercising with, when evaluating the received social support. Thereby, the causal mechanisms underlying the enabling effect of social support on exercising cannot be investigated. Thus, this study aimed at running an intervention- and control group design. Moreover, previous research mainly focused on the direct effect of social support on physical activity. If self-regulative processes as possible mediators between social support and behaviour (physical activity) were taken into account, then in most cases only one construct was considered. Thus, our study aimed at investigating several self-regulative processes as possible mediators between received social support and physical exercise. In so doing, we can find out whether received social support not only enables self-efficacy, but also self-monitoring and action planning. Furthermore, our aim was to depict

which type of social support (emotional and instrumental) is most predictive for self-efficacy, self-monitoring, and action planning.

Method

Participants and Procedure

This study is part of a larger project, which investigated the contribution of received social support on physical exercising (Rackow, Scholz, Sniehotta, & Hornung, 2013). The intention to begin or increase one′s own physical exercise was the inclusion criterion for participating in our study. We recruited in two different ways. Firstly, we recruited participants in two locations of a Swiss federal research institute. We randomly distributed 35 paper-pencil questionnaires (T0) among individuals who were interested in participating, and met the above-mentioned criterion. Of the 35 questionnaires, 26 were returned (n = 6 control group; n = 20 intervention group). Secondly, the link of an online screening online-questionnaire (T0) was distributed via health-related websites, an advertisement in a university internal journal, and flyers for display within group practices of a health insurance company. By this method, we were able to reach 301 persons who clicked on the link of the screening questionnaire. By clicking on the link the participants were randomized to intervention and control group. Of these 301 persons, 104 (n = 55 control group, n = 49 intervention group) declined participation. Taken the participants form both recruitment modes together, n = 121 participants formed the intervention group, and n = 102 participants formed the control group. A detailed description of the participants' flow is provided in Rackow, Scholz, Sniehotta, and Hornung (submitted). The task of the intervention group was to exercise together with a new sports companion for the time of study (eight weeks). The control group did not receive such an instruction. Both groups were sent three online questionnaires within a four-weeks interval.

Dropout analysis revealed that there were no significant differences concerning age

($t(169.41) = -1.65$, $p = .10$), gender ($U = 3372.5$, $p = .13$), and exercising at T1 ($t(161) = -1.57$, $p = .12$) between participants who only filled out T1 and participants who filled out T1, T2, and T3. Moreover, participants who dropped out did not significantly differentiate form participants who filled out all questionnaires concerning received emotional social support at T1 ($t(144) = -1.57$, $p = .12$) as well as received instrumental social support at T1 ($t(145) = -1.57$, $p = .12$).

The majority of participants were women ($n = 125$, 68.7%), and had a mean age of 34.2 years ($SD = 11.0$ years) with a range from 17 to 71 years. Of the participants, 171 (92.1%) reported to be employed, three individuals (1.7 %) reported to be solely housewife/househusband, and four individuals (2.8 %) reported to be unemployed. Having a high-school degree was reported by 113 (62.6 %) persons, 63 individuals (34.8%) reported not to have a high-school degree. About half of the participants 87 (47.8 %) reported to be single, 85 (46.7 %) were married or living with a partner, and 9 (4.9 %) reported to be divorced. One person did not indicate his or her family status. About a fourth ($n = 24.7$ %) indicated to have children.

Measures

The socio-demographic variables and physical exercising were assessed at T0. At T1 received social support and physical exercising were measured, at T2 action planning, self-efficacy, and self-monitoring were measured, and at T3 again physical exercising was assessed. The sample means of the respective constructs are reported below. The group means are reported in table 3.

Received emotional social support. To determine the degree to which participants received emotional support by their exercise companion within the past seven days, the subscale received emotional social support of the Berlin Social Support Scale (Schulz & Schwarzer, 2003) was adapted to the context of physical exercise. It comprises five items, for

example ‘‘This person comforted me with regard to my physical exercise“ (for a German version see Appendix A). Response range was from 1 = “not at all true” to 7 = “exactly true”. Time 1 received emotional social support had a sample mean of 5.26 (*SD* = 1.29) and Cronbach′s α = .86.

Received instrumental social support was also assessed by a context-adapted version of the corresponding subscale of the Berlin Social Support Scale (Schulz & Schwarzer, 2003) and the provided answers again referred to the past seven days. It comprises seven items, for example “This person offered me his/her help to maintain my physical exercise” (for a German version see Appendix A). Having the same response range as received emotional social support, Time 1 received instrumental social support had a sample mean of 4.58 (*SD* = 1.48) and Cronbach′s α = .90.

Action planning was assessed by four items (Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008) (Cronbach′s α = .88). The item stem “I have a detailed plan…”, was followed by for example the item “… when to do my physical exercise”. Participants provided their answers on a 6-point-scale ranged from 1 = “not at all true” to 6 = “exactly true”. Time 2 action planning had a sample mean of 4.42 (*SD* = 1.10).

Self-monitoring was assessed by three items (Scholz, Nagy, Schüz, & Ziegelmann, 2008) (Cronbach′s α = .84). The items were introduced by the stem “During the last seven days, I have… (a)… constantly monitored myself whether I exercise frequently enough, (b)… always been aware of really exercising on a regularly basis, (c)… constantly monitored myself whether I exercise the way I intended”. The response range was from 1 = “not at all true” to 6 = “exactly true”. Time 2 self-monitoring had a sample mean of 3.82 (*SD* = 1.29).

Self-efficacy (Scholz, Schüz et al., 2008) was assessed with the following introduction: “After having started engaging in physical exercise regularly on a long-term basis. How confident are you that you will succeed in doing so?” The item stem “I am

confident to engage in physical exercise regularly on a long-term basis…" was followed by four items covering typical barriers that may impede exercising, such as "even if I cannot see any positive change immediately". Time 2 self-efficacy had a sample mean of 4.41 (*SD* = 0.93). The response range was from 1 = "not at all true" to 6 = "exactly true".

Physical exercise. Vigorous physical exercise at T1 and T3 was assessed by one item of the International Physical Activity Questionnaire (IPAQ, Booth, 2000). Participants were asked to indicate how often during the past seven days they had engaged in vigorous physical activities such as jogging, swimming or weight lifting. Additionally, they indicated how much time they usually spent performing those activities per exercise occasion. Frequency and average duration per exercise occasion were then multiplied in order to obtain a measure of weighted duration for the past seven days. At T1 the participants exercised on average 3.03 hours a week (*SD* = 2.50 hours). At T3, they exercised on average 3.56 hours a week (*SD* = 2.48 hours).

Data Analysis

Descriptive statistics, scale values, and Cronbach′s alphas were computed with SPSS 18. Path analyses with maximum likelihood estimation were employed to examine associations between social support, action planning, self-monitoring, self-efficacy, and physical exercise. The fact that one model was formulated for two different groups (intervention and control group) implies multigroup modelling (Hoyle, 2011). All models were calculated with M*plus* 6.1 (Muthén & Muthén, 2010). To compare nested models in order to evaluate differences between the path models of intervention and control group, χ^2 difference test (Crayen, 2010) was used. Therefore, all models were forced to equal loadings. Missing values were treated using Full Information Maximum Likelihood (FIML; Arbuckle, 1996).

Results

Descriptives

At T1, there are significant differences in received instrumental social support between control and intervention group ($t(173) = -2.29$, $p = .02$, $d = 0.35$). The participants in the intervention group reported to receive more instrumental social support. Whereas, concerning emotional social support, there were no significant differences between the groups at T1 ($t(173) = 0.62$, $p = .54$; $d = 0.09$). Correlations between all variables and descriptives of all variables under study are presented separately for intervention and control group in Table 3.

Path analyses

Figure 11 and 12 display the multigroup path analyses, separately for intervention and control group, for testing the enabling effect of received *emotional* social support (T1) on physical exercise (T3) via the mediators action planning, self-monitoring, and self-efficacy (T2). Results showed that for the control group that received emotional social support at T1 was not associated with action planning, self-monitoring, or self-efficacy at T2. Moreover, these constructs were in turn not able to predict physical exercise at T3. The only significant predictor for physical exercise at T3 was past behaviour (physical exercise at T1). A different picture emerged for the intervention group: Received emotional social support at T1 positively predicted action planning, self-monitoring, and self-efficacy at T2. In turn, self-monitoring and self-efficacy (T2) predicted physical exercise at T3. Furthermore, a total indirect effect connected by all mediators became significant ($\beta = .20$, $p = .02$). More specifically, the indirect effect from received emotional social support to physical exercise via self-efficacy ($\beta = .18$; $p = .02$) mainly contributed to this indirect effect. To confirm these indirect effects, bias corrected bootstrapping was employed (Geiser, 2010), and both

significant indirect effects were confirmed (total indirect effect: 95%-confidence interval (CI) [.01, .40]; specific indirect effect via self-efficacy: CI [.02, .34]).

To evaluate whether the model of the control group and the model of the intervention group differ from each other, when loadings were forced to be equal, a χ^2 difference test (Crayen, 2010) was computed. We stepwise forced one path after the other to be equal in the control as well as in the intervention group, and the results indicate that the two models are different from each other (e.g., when all paths were forced to be equal: χ^2 (Δ df = 8) = 17.14; p = .03).

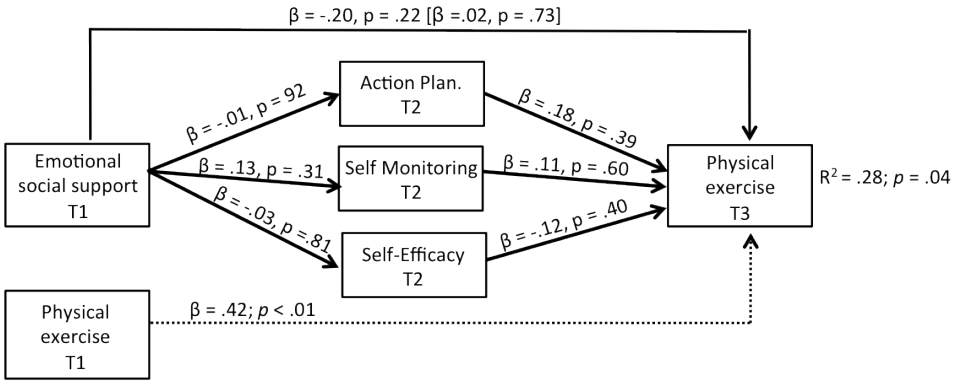


Figure 11. Relationships between emotional social support, action planning, self-monitoring, self-efficacy, and physical exercise for the control group (n = 79). *Note.* Standardised path coefficients are reported; correlations between the constructs are omitted in the figure; Action plan. = action planning

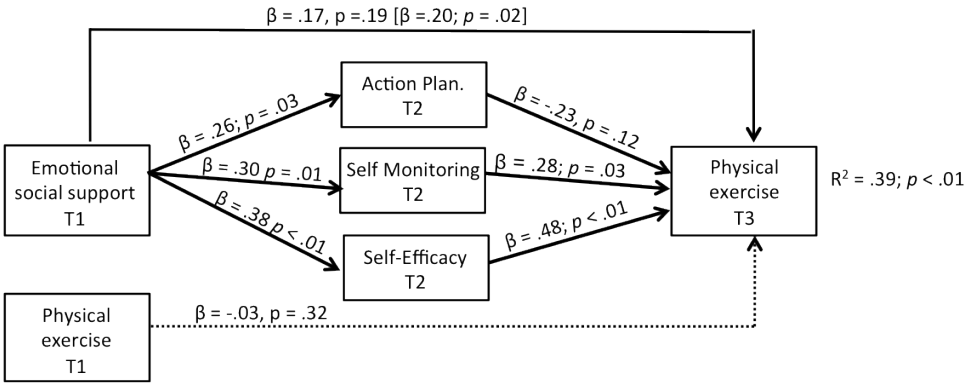


Figure 12. Relationships between emotional social support, action planning, self-monitoring, self-efficacy, and physical exercise for the intervention group (n = 96). *Note.* Standardised path coefficients are reported; correlations between the constructs are omitted in the figure; Action plan. = action planning.

In Figure 13 and 14 the results of the path analyses for testing the enabling effect of received *instrumental* social support (T1) on physical exercise (T3) via the mediators action planning, self-monitoring, and self-efficacy (T2) are presented. Results show that for the control group received instrumental social support at T1 was not associated with action planning, self-monitoring, or self-efficacy at T2. Again, these constructs were not able to predict physical exercise at T3, and the only significant predictor for physical exercise at T3 was past behaviour (physical exercise at T1). For the intervention group the findings were more heterogeneous. Received instrumental social support at T1 positively predicted action planning at T2, but not self-monitoring and self-efficacy. Self-efficacy and self-monitoring could in turn predict physical exercise at T3. Past behaviour (physical exercise at T1) did not contribute to the explanation of physical exercise at T3. Moreover, there was no significant indirect effect from received instrumental social support via the three mediators on exercise behaviour. We again computed χ^2 difference tests to evaluate whether the model of the control group and the model of the intervention group differed from each other, when loadings were forced to be equal. Again, we stepwise forced one path after the other to be equal in both groups. The results indicated that the two models were not different from each other (e.g., when all paths were forced to be equal: χ^2 (Δ df = 8) = 14.82; p = .06).

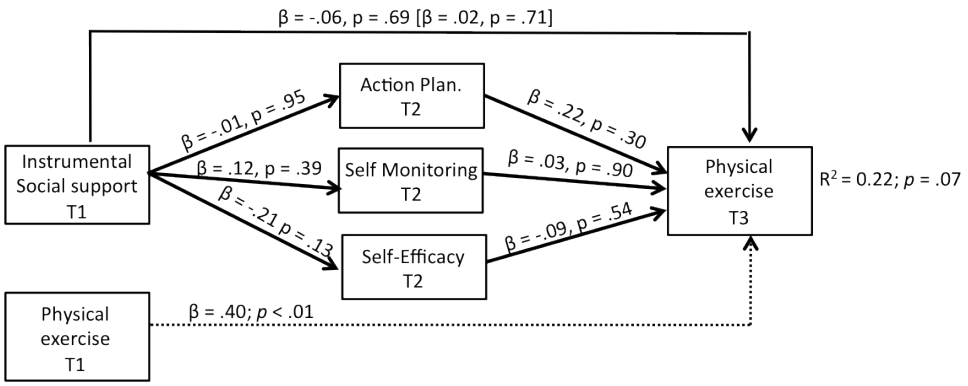


Figure 13. Relationships between instrumental social support, action planning, self-monitoring, self-efficacy, and physical exercise for the control group (n = 79). *Note.* Standardised path coefficients are reported; correlations between the constructs are omitted in the figure; Action plan. = action planning.

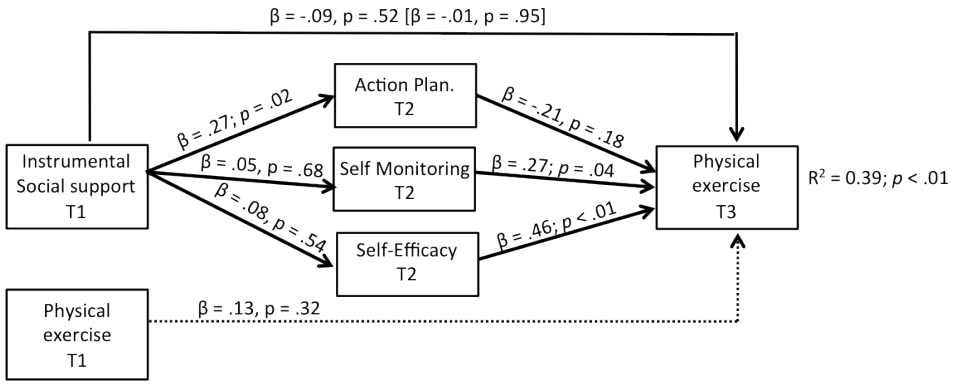


Figure 14. Relationships between instrumental social support, action planning, self-monitoring, self-efficacy, and physical exercise for the intervention group (n = 96).
Note. Standardised path coefficients are reported; correlations between the constructs are omitted in the figure; Action plan. = action planning

Discussion

The aim of our study was twofold. The first aim was to investigate the enabling effects received social support on physical exercising via the mediators self-efficacy, action planning, and self-monitoring. The second aim was to depict the discriminative effects of received instrumental and emotional social support on physical exercising as well as on the mediators mentioned above. In so doing, the enabling hypothesis proposed by Benight and Bandura (2004) might be extended by self-monitoring and action planning. Moreover, the conducted study comprised an intervention and control group design. Therefore has been, to the best of our knowledge, among the first studies that conducted an intervention and control group design to investigate the effects of received social support.

For the intervention group, our results indicate that the effect of received emotional social support on physical exercise was present for all mediators namely self-efficacy, self-monitoring, and action planning. Especially, the indirect effect from received emotional social support to physical exercise via self-efficacy contributed to the total effect, which is directly in line with the enabling hypothesis of social support (Benight & Bandura, 2004). Whereas for the control group, received emotional social support was neither associated with

one of the mediators, nor with physical exercise. Thus, there was no mediation effect of received emotional social support via self-efficacy, self-monitoring, or action planning on physical exercise. A different picture emerged for received instrumental social support. In the intervention group, instrumental social support predicted action planning, but was not associated with self-efficacy and self-monitoring. With regard to the prediction of physical exercise at T3, only self-efficacy and self-monitoring emerged as significant predictors. No direct or indirect effect of received instrumental social support on physical exercise could be demonstrated. In the control group, received instrumental social support was neither associated with any of these mediators, nor with physical exercise. Again, a direct or indirect effect of received instrumental social support on physical exercise could not be demonstrated as well.

In terms of social support in general, our findings are in line with findings by McAuley and colleagues (2003), and others (Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993). However, our findings exceed previous results because they highlight the discriminative contributions of the different kinds of received social support on exercise behaviour. Received emotional social support emerged as a significant predictor for self-efficacy, self-monitoring, and action planning, whereas instrumental social support was only able to predict action planning. Thus, the enabling hypothesis could only be confirmed for received emotional but not for received instrumental social support. These findings were rather unexpected, because the idea to find a new sports companion to exercise with should target instrumental social support, as instrumental social support can be described as concrete and practical assistance (Schwarzer & Knoll, 2011). On the one hand, intervention and control group differed form each other with regard to instrumental social support at T1, in such a way that participants in the intervention group reported to receive more instrumental social support. However, this instrumental social support was associated with action

planning, but not with self-efficacy and self-monitoring at T2. The question arises why the two groups differ at T1 regarding instrumental social support. One possible explanation could be that the process of searching and finding a new sports companion previously boosted the instrumental social support before the T1 online-questionnaire and with this the first assessment of social support itself took place. In other words, the assessment of social support came too late to capture the process of social support accurately. Next time, we should find a way to access the received social support at the moment when the two sports companions get together and, for example, make plans for their exercising.

In terms of enabling, received instrumental social support could not be translated into self-efficacy and self-monitoring, only to some degree into action planning. In contrast, received emotional social support displayed the expected enabling effects on all three volitional constructs of the HAPA in the intervention, but not in the control group.

Our results also seem to be of practical relevance for intervention planning. They indicate that received social support by a new sports companion can help to initiate new behaviours, because in the intervention group, exercising T1 was not a significant predictor for exercising at T3. Whereas for the control group exercising at T1 was the only significant predictor for exercising at T3, indicating a higher stability with regard to lower levels of activity. Thus, the social support intervention countered the impact of past behaviour and enabled new behaviour.

Some limitations also need to be addressed. Our idea was to recruit participants who wanted to enhance their physical exercise. On the one hand we succeeded in it, because at least in the intervention group the participants exercised more at T3 as at T1 on average. But on the other hand our participants already reported relatively high exercise levels at T1. Thus, the question arises if our results are applicable for persons who do not exercise at all.

In this study, received emotional social support played an important role. It might be that individuals who are already engaged in exercising on a relatively regular basis and whose aim was to enhance exercising instead of to beginning to exercise, benefit more from this kind of support and encouragement, than from instrumental social support. As described above, instrumental social support comprises “concrete assistance”. With regard to physical exercise, it could mean “exercising together”, but also offering concrete ideas to help the individual to engage in the intended behaviour. It might be that this concrete assistance relating to physical exercise is more important for individuals, who are still in the phase of developing their exercise regimen than in the phase of maintaining their exercise habits.

In terms of maximising public health benefits, future research should also target individuals, who want to begin physical exercising. For this, other strategies to recruit participants should be administered. Another point future research should deal with is the source of the received social support. In our study, participants were free to choose their sports companion in terms of the function this companion has for the participant. This means, the sports companion could be a friend, a work colleague, or a spouse, for example. In order to have a closer look on the contribution different sources of social support have on physical exercise, future research should either hold the source of social support constant (e.g., always the spouse as the support provider), or study larger samples in order to obtain subgroups of different support sources to analyse them independently. In this regard, it would also be interesting to consider the dyadic perspective of received social support. We only had the data of the support receiver available but not of the support provider. Future research should collect data from both parts of the “exercising dyad”. For example, to evaluate if the given support reaches the support receiver as indented. Moreover, a dyadic approach would also allow examining the effects of differences in physical exercise in the support provider on the enabling function of social support. For example, support providers who are themselves

inexperienced exercisers might provide less effective support than support providers who are exercising on a regular basis for a long time.

To conclude, our study provides evidence for the enabling effects of received emotional social support on physical exercising via the mediators self-efficacy, self-monitoring, and action planning. Moreover, received emotional and instrumental social support displayed different enabling effects on self-efficacy, action planning and self-monitoring for the intervention and the control group. These results emphasize the importance of considering different kinds of social support and their role for health behaviour change.

Table 3.

Intercorrelations and descriptive statistics for emotional and instrumental social support, action planning, action control, maintenance self-efficacy, and physical exercise, displayed separately for intervention and control group.

	2	3	4	5	6	7	Range	M	SD
Control group									
1. Emotional social support (T1)	.34**	-.05	-.07	.14	-.05	-.04	1-7	5.34	1.33
2. Instrumental social support (T1)		-.21	.003	.08	-.04	.01	1-7	4.30	1.55
3. Self-efficacy (T2)			.31*	.27*	.10	.20	1-6	4.44	0.89
4. Action planning (T2)				.65**	.21	.06	1-6	4.33	1.11
5. Self-monitoring (T2)					-.23	.20	1-6	3.93	1.29
6. Physical exercise (T1)						.40*	0.50 - 9.00 h[1]	2.77 h[1]	2.79 h[1]
7. Physical exercise (T3)							0.17 - 11.34 h[1]	2.71 h[1]	2.19 h[1]
Intervention group									
1. Emotional social support (T1)	.53**	.38**	.26*	.31*	.21	.16	1-7	5.22	1.24
2. Instrumental social support (T1)		.08	.27*	.05	.02	-.10	1-7	4.81	1.39
3. Self-efficacy (T2)			.43**	.41**	.50**	.42**	1-6	4.38	0.96
4. Action planning (T2)				.40**	.10	.19	1-6	4.50	1.09
5. Self-monitoring (T2)					.42**	.36**	1-6	3.70	1.29
6. Physical exercise (T1)						.38**	0.19 - 9.60 h[1]	3.08 h[1]	2.26 h[1]
7. Physical exercise (T3)							0.34 - 9.00 h[1]	4.09 h[1]	2.56 h[1]

Note. * $p < .05$ ** $p < .01$; [1] reported for the last seven days

Chapter IV

The German Psychological Need Satisfaction in Exercise Scale – Validation of a Measure of Need Satisfaction in Exercise

Pamela Rackow, Urte Scholz, & Rainer Hornung

A similar version of this chapter is accepted for publication

(Rackow et al., in press)

Abstract

Objectives. Self-determination theory (SDT) has become an established framework for exploring motivational processes in physical exercise. Integral components of SDT are three basic psychological needs. Our study aimed at translating and validating a German scale to measure need satisfaction while exercising.

Methods. A total of 614 individuals (n = 347 female, age: M = 38.39 years, SD = 12.05) drawn from one private fitness centre, different sport clubs, and the Academics Sports Association Zurich (ASVZ) took part in the online-based baseline assessment. Nine months later, 216 participants completed the online follow-up questionnaire (T2).

Results. The results demonstrate an adequate factorial validity and internal consistency at both measurement points. Moreover, construct validity could be demonstrated through medium to strong correlations with several motives to exercise and self-efficacy towards physical exercise. Additionally, the three subscales were differentially predictive for different types of motivation (for example intrinsic and extrinsic) at T2, indicating good criterion validity.

Conclusions. The newly developed German scale is a reliable and valid instrument to assess need satisfaction in the context of physical exercise and predicts motivation over time.

Keywords: basic need satisfaction, self-determination theory, validation, physical exercise

In most western industrialized countries, adults lead a sedentary lifestyle (Hardman & Stensel, 2003), although regular exercise is important to obtain and keep physical and psychological health (Cavill, Kahlmeier, & Racioppi, 2006). Self-determination theory (SDT; Ryan & Deci, 2004) has become an established framework for exploring motivational processes in exercise and helps to understand motivational factors of exercise participation (Vlachopoulos, Kaperoni, & Moustaka, 2011). An important condition for research is the access to reliable and valid scales to assess psychological constructs within existing theories. Thus, it is relevant to provide well-translated scales that also fulfil psychometric requirements like factorial composition and internal consistency. For example, Schweizer (2010) stated that especially in Europe, where a broad range of languages and cultures is present, "…measures have to be developed […] and validated for each and every European language…" (p. 75). To our knowledge, there is no translated and validated measure of need satisfaction in exercise in German, although need satisfaction is a core construct in SDT (Ryan & Deci, 2004). Thus, the aim of this study was to generate a reliable and valid German measure of need satisfaction in exercise. Validity refers to the extent to which a measure assesses what it claims to measure. One distinction can be made between construct and criterion validity. Construct validity refers to whether a scale correlates with related psychological constructs, and criterion validity is based upon associations with several criteria (Bühner, 2006).

Self-determination theory

Deci and Ryan (2000) presume that the motivation for certain behaviour varies along a motivational continuum ranging from intrinsic to extrinsic motivation. Intrinsic motivation indicates a self-determined behaviour, meaning that a person experiences own interests and fun during activity. Extrinsic motivation is subdivided into four motivational styles:

Integrated, identified, introjected, and external regulation. They can be distinguished by their proportion of self-determination. External regulation is the motivational style with the smallest proportion of self-determination. When behaviour is regulated introjectedly, it is characterized by avoiding disapproval from external sources (e.g., friends). When people act through identified regulation, they identify with the value of the action. Finally, among the different kinds of extrinsic regulation, integrated regulation has the highest degree of self-determination (Ryan & Deci, 2007). The more self-determined a behaviour is, the more likely a person persists in it (Ryan & Deci, 2004) and the more well-being is associated (Ryan, Deci, & Grolnick, 1995). People can develop the motivational style of certain behaviour from a less self-determined (external regulation) to a more self-determined (integrated regulation) by "internalization" (Ryan & Deci, 2004).

In SDT, Deci and Ryan (2000) assume three basic psychological needs for autonomy, competence and relatedness, and define them as „... innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (p. 229). Autonomy refers to experiencing choice and feeling like the initiator of one's own action, while competence means interacting effectively with the environment (Vlachopoulos & Michailidou, 2006). Competence is comparable to Bandura's self-efficacy (1997). Perception of relatedness is based on building relationships and on experiencing mutual respect and reliance with others (Ryan & Deci, 2004). Need satisfaction can facilitate internalization and is important for experiencing self-determination and intrinsic motivation (Ryan & Deci, 2004). Therefore, we will use the prediction of intrinsic motivation by need satisfaction to demonstrate the criterion validity of the newly developed Psychological Need Satisfaction in Exercise Scale – German (PNSEG). Furthermore, SDT presumes that need satisfaction is important for the attainment and maintenance of well-being (Gagné, Ryan, & Bargmann, 2003), which has been affirmed by several diary studies (e.g., Reis, Sheldon, Gable, Roscoe,

& Ryan, 2000; Gagné, Ryan, & Bargmann, 2003). We will use indicators of well-being to demonstrate the criterion validity of the newly developed PNSEG. Another motivational construct related to intrinsic motivation is flow experience (Frederick-Recascino, 2002). When people experience flow they feel fully immersed in the activity. In SDT, flow experience is associated with intrinsic motivation by means of increased awareness and enhanced feelings of well-being (Frederick-Recascino, 2002; Kowal & Fortier, 1999). Thus, we will also assess flow experience for examining the criterion validity of the PNSEG. Prior research in the exercise domain has provided evidence for the relationship between need satisfaction, self-determined motivation and self-reported exercise (e.g., Russell & Bray, 2009; Vlachopoulos & Michailidou, 2006; Wilson, Rodgers, & Fraser, 2002). In order to test the criterion validity of the newly developed scale, associations between exercise and the PNSEG will be examined.

Measuring basic need satisfaction in exercise

Given the importance of domain specific instruments to assess psychological constructs adequately (e.g., Ryan, 1995; Vlachopoulos & Michailidou, 2006), it was necessary to design a scale for estimating the extent to which the three basic needs are satisfied in exercise. Wilson, Rogers, Rodgers, and Wild (2006) introduced the Psychological Need Satisfaction in Exercise Scale (PNSE), an 18-items measure to assess satisfaction of autonomy, competence, and relatedness during exercise. The authors conducted two studies with undergraduate students. The resulting three-factorial structure was consistent with the assumptions of SDT, well interpretable, and could be affirmed in a second study (Wilson et al., 2006). Likewise, Vlachopoulos and Michailidou (2006) presented "The Basic Psychological Needs in Exercise Scale" (BPNES) in Greek. Their sample comprised exercise participants of private fitness centres (age 18-64). They demonstrated an adequate factor structure by using a confirmatory factor analysis (CFA), including its reproducibility across

two separate samples, good internal consistency, and good test-retest reliability over a four-week period. A French measure to assess need satisfaction in exercise was introduced by Gillet, Rosnet, and Vallerand (2008). Their sample comprised French adolescent semi-professional tennis players. The results showed a sufficient factor structure and good internal consistency. Based on this French version, Domínguez, Martín, Martín-Albo, Núñez, and León (2010) constructed a Spanish measure of need-satisfaction in exercise, which had acceptable fit indices regarding a CFA, good Cronbach's alpha values and a good test-retest reliability after ten weeks. Their sample was composed of federated Spanish athletes.

Aim of the present study

As demonstrated above, need satisfaction is important to explain the motivational process within SDT. As there is no German measure, the purpose of our study was to translate the existing English and Greek measures into German, and develop a reliable and valid scale to assess need satisfaction in the exercise domain. Our study included the following scale construction steps: Translation of the Greek (Vlachopoulos & Michailidou, 2006) and English (Wilson et al., 2006) measures into German, item selection for the final version, examining the factorial structure, testing the structure in two randomized split samples in order to replicate the factor structure as well as with the same sample after nine month, assessing internal consistency, testing criterion and construct validity. For assessing construct validity we utilize self-efficacy towards physical exercise, and several motives for being engaged in exercise. For assessing criterion validity, we measure the participants' motivational style for exercise, flow experience, and well-being. We decided our scale to be based on the English and the Greek version because the items and the addressed samples are applicable in leisure sport settings. In contrast, the French and Spanish versions were tested with semi-professional athletes. Moreover, the English and the Greek scales are two independent scales with the advantage to cover a broader range of aspects of need

satisfaction. In contrast, the Spanish scale is an adapted version of the French one. Finally we assess the test-retest reliability of the PNSEG over a 9-months period.

Method

Participants/Sample

A total of 654 people were recruited from one private fitness centre, different sport clubs, and the Academics Sports Association Zurich (ASVZ)[1]. This recruitment procedure assured the needed heterogeneity of participants and type of sports participants engaged in. At baseline (T1), participants filled out an online questionnaire. At the end of the questionnaire, they could indicate whether they were interested to participate in a second measurement point. If this was the case, they could provide their e-mail address. After excluding those participants, who did not answer at least one of the need-satisfaction items, 614 persons remained in the sample (56.5% female, 1.8% did not indicate their gender). The participants' age ranged from 16 to 81 years (M = 38.39 years, SD = 12.05 years). Half of the participants (52.45%) had a high-school degree, 39.71 % got vocational training, and 458 (74.59%) reported to be employed. Nine month later, the second measurement (T2) took place and was completed by a total of 227 participants. After excluding those participants, who did not answer at least one of the need-satisfaction items at T2, 216 persons remained in the retest sample. Dropout analyses revealed that there were no significant differences concerning age ($t(583) = 0.36$, $p = .72$), gender ($\chi^2(1) = 0.39$, $p = .72$), education ($\chi^2(8) = 9.12$, $p = .33$), employment ($\chi^2(1) = 1.05$, $p = .31$), exercise ($t(612) = -0.29$, $p = .77$), satisfaction of autonomy ($t(592) = -0.41$, $p = .68$), competence ($t(581) = -1.40$, $p = .99$), and relatedness $t(580) = -0.02$, $p = .16$) between the participants who completed both measurements and those who only completed T1.

[1] Academic Sports Association Zurich (ASVZ, 2012) provides a sports and exercise program to all students, employees, and alumni of the University of Zurich (UZH) and the Swiss Federal Institute of Technology Zurich (ETH). It offers a broad range of 80 kinds of sports (ASVZ, 2012).

Development of the new scale

The PNSEG is based on the BPNES (Vlachopoulos & Michailidou, 2006) and on the PNSE (Wilson et al., 2006) which both assess need satisfaction in exercise. The rationale for using both scales to develop the German measure was that we aimed at maximizing the coverage of all important aspects of the target constructs. We thus used 30 items from both instruments and translated them into German using the back-translation method (Brislin, 1970). These 30 items were then evaluated as follows: One item should contain one meaning, and uncommon and ambiguous expressions as well as any generalization should be avoided (Oppenheim, 1992). In total, 19 items were retained, seven for both subscales competence and relatedness, and five for autonomy. The item order was randomized.

Measures

If not mentioned explicitly, participants provided their answers on a 7-point-scale (*I do not agree at all* (1) to *I very strongly agree* (7)).

Motives to exercise. To determine the degree to which participants have intrinsic motives to exercise, the enjoyment/interest and competence subscales of the MPAM-R (Ryan, Frederick, Lepes, Rubio & Sheldon, 1997) were employed. The social subscale was used to determine whether participants hold social motives to exercise. Motives are no measure of intrinsic or extrinsic motivation (Frederick & Ryan, 1993), but aim at assessing "… the satisfaction one gains from engaging in the activity…" (Ryan, et al., 1997, p. 336). Hence, for validating the need satisfaction in exercise items associations with the motives is indicated. Cronbach's alpha coefficients were $\alpha = .73$ for the subscale competence (Item example: 'I am exercising, because I want to obtain new skills'; $M = 4.90$; $SD = 1.17$), $\alpha = .80$ for enjoyment/interest (e.g.: 'I am exercising, because I enjoy this activity'; $M = 6.21$; $SD = 0.87$), and $\alpha = .92$ for social (e.g.: 'I am exercising, because I want to be with others in activity'; $M = 4.69$; $SD = 0.87$).

Self-efficacy towards physical exercise. To assess a person‘s beliefs about his or her own ability to engage in regular exercise despite potential barriers (for example, ‘I am confident that I can exercise like indented even if I still have a lot of work to do’; *M* = 4.92; *SD* = 0.91), the “Self-efficacy towards physical exercise” scale (Fuchs & Schwarzer, 1994) was administered. It contains 12 items, Cronbach’s alpha coefficient was α = .84.

Sport and exercise related self-concordance[2]. Self-determined motivation was assessed with the scale “Sport and exercise related self-concordance” by Seelig and Fuchs (2006). It includes 12 items with three items for each subscale: Intrinsic (for example: ‘I am exercising because it is fun’; *M* = 5.60; *SD* = 1.00), identified (e.g.: ‘I am exercising because it is important for me personally’; *M* = 5.25; *SD* = 0.94), introjected (e.g.: ‘I am exercising because I would feel bad, if I would not do’; *M* = 3.23; *SD* = 1.17), and extrinsic motivation (e.g.: ‘I am exercising because others say that I should’; *M* = 1.55; *SD* = 0.65). The internal consistency for the subscales were as follows: Intrinsic motivation: α = .66; identified motivation: α = .53; introjected motivation: α = .61, and extrinsic motivation: α = .51.

Flow. To assess participants’ flow experience the Flow-Short-Scale (Rheinberg et al., 2003) was used. The ten items measure several aspects of flow experience (for example: ‘I feel just the right amount of challenge”; *M* = 5.30; *SD* = 0.74) and the Cronbach’s alpha coefficient was α = .87.

PANAVA. To determine participants’ well-being while exercising, the scale for measuring Positive Activation (PA), Negative Activation (NA), and Valence (VA) (PANAVA; Schallberger, 2000) was employed. This measure is based on the Positive and Negative Affect Schedule (PANAS, Watson, Clark, & Tellegen, 1988) with the additional dimension “valence” (e.g., happy vs. unhappy). The Cronbach’s alpha value for positive

[2] We used “Sport and exercise related self-concordance” for assessing the motivational style (1) because it is the only validated German measure, and (2) because of the conceptual similarities between self-concordance and self-determination (Seelig & Fuchs, 2006).

activation was α = .79 (four items; for example ‘How do you feel right after exercising? Happy’; *M* = 5.74; *SD* = 0.90), α = .75 for negative activation (four items; e.g.: ‘stressed’; *M* = 2.06; *SD* = 0.76), and α = .68 for valence (two items; e.g., ‘pleased’; *M* = 6.50; *SD* = 0.62).

Physical exercise. Vigorous physical exercise at T1 and T2 was assessed with the International Physical Activity Questionnaire (IPAQ; Booth, 2000). Participants were asked to indicate how often during the past seven days they had engaged in vigorous physical activities such as jogging, swimming or weight lifting. Additionally, they indicated how much time they usually spent performing those activities per exercise occasion. Frequency and average duration per exercise occasion were then multiplied in order to obtain a measure of weighted duration for the past seven days. At T1 the participants exercised on average 4.88 hours a week (*SD* = 4.31 hours). Most participants (*n* = 248, 40.39%) reported to carry out muscle training (e.g., weight lifting, back muscle training) or jogging (*n* = 211, 34.36%). At T2, they exercised on average 5.60 hours a week (*SD* = 4.74 hours). Again, most participants (*n* = 73, 33.80%) reported to carry out muscle training or jogging (*n* = 70, 32.41%).

Data analysis

Descriptive statistics and scale values were computed with SPSS 18. In order to examine the factor structure of the PNSEG a CFA with M*plus* 6.1 (Muthén & Muthén, 2010) was calculated. For the CFA goodness-of-fit indices are reported. The χ^2 goodness-of-fit statistics describe the magnitude of discrepancy between the sample and the fitted covariance matrix (Hu & Bentler, 1999). Additionally the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI) are utilized. They are incremental fit indices, which compare the fit of the target model with the baseline-model (Geiser, 2010). Acceptable fit is indicated by values greater than .90 (Hu & Bentler, 1999). The Root-Mean-Square-Error-of-Approximation (RMSEA) measures the approximate datafit of the model and

Table 4

Descriptive statistics and corrected item-total correlations (r_{it}) for the three subscales of the PNSEG (T1 and T2)

Subscale	Item	Item wording	T	*n*	*M*	*SD*	r_{it}	*S*	*K*
Autonomy	Auto_1	I feel that the way I exercise is an expression of myself.	T1	601	4.91	1.47	.49	-0.64	-0.19
			T2	209	4.92	1.41	.57	-0.65	0.02
	Auto_2	I feel that I have the opportunity to make choices with respect to the way I exercise.	T1	599	5.37	1.29	.39	-0.83	0.44
			T2	210	5,37	1.31	.50	-0.91	0.65
	Auto_3	The exercise program I follow is highly compatible with my choices and interests.	T1	596	5.83	0.94	.48	-1.07	2.20
			T2	211	5.52	1.16	.68	-1.31	2.19
Competence	Comp_1	I feel confident in my ability to attend to exercising regularly.	T1	598	5.53	1.17	.48	-1.00	1.03
			T2	211	5.31	1.34	.62	-1.07	1.04
	Comp_2	I feel I can manage with the requirements of the training program I am involved.	T1	595	5.82	0.85	.48	-0.73	0.59
			T2	208	5.77	0.85	.40	-1.39	4.56
	Comp_3	I feel I execute very effectively the exercise of my trainings program.	T1	589	5.30	0.96	.42	-0.26	-0.37
			T2	207	5.15	1.06	.51	-0.63	1.25
	Comp_4	I feel I have been making huge progress with respect to my training.	T1	592	5.23	1.02	.50	-0.52	0.13
			T2	205	5.06	1.13	.61	-0.81	1.39
Relatedness	SoRe_1	I feel connected to the people I interact with while we exercise.	T1	597	4.51	1.56	.51	-0.53	-0.39
			T2	211	4.60	1.57	.57	-0.64	-0.19
	SoRe_2	I feel that I associate with the others participants in a very friendly way.	T1	595	5.25	1.31	.57	-1.15	1.30
			T2	211	5.07	1.42	.58	-0.92	0.69
	SoRe_3	I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons.	T1	591	5.03	1.46	.55	-0.84	0.27
			T2	208	5.67	1.13	.66	-1.83	4.96
	SoRe_4	I feel comfortable when I am with the other exercise participants.	T1	585	5.10	1.34	.56	-0.86	0.53
			T2	208	5.02	1.36	.71	-0.89	0.49

Note. 7-point response scale – anchored by 1 = *I do not agree at all* to 7 = *I very strongly agree*. T = time point; S = skewness; K = kurtosis; PNSEG = Psychological Needs in Exercise Scale – German. Original items are in German (see Appendix B). Participants were provided with the following instruction for filling out the items: "The following statements refer to situations in which you are exercising. Please indicate how much the following statements apply to you personally".

the Standardized-Root-Mean-Square-Residual (SRMR) is important to evaluate the residuals. Both should be lower than .05 (Geiser, 2010). The Akaike Information Criterion (AIC) is a descriptive measure to compare different (non-nested) models. The model with the lowest AIC should be preferred (Geiser, 2010). Missing values were treated using Full Information Maximum Likelihood (FIML; Arbuckle, 1996).

Results

Preliminary Analysis

The first step to select the final items for the PNSEG was to examine the corrected item-total correlation of the 19 items. Two items (both autonomy items: "I feel free to exercise in my own way" and "I feel free to make my own exercise program decisions"; Wilson et al., 2006) had corrected item-total correlations below .30 and were therefore excluded (Field, 2009). In the second step, we aimed at identifying items that strongly defined their assigned factor as well as items that were weakly related to the factor. Because of this, an initial CFA with M*plus* 6.1 (Muthén & Muthén, 2010) with the remaining 17 items was performed. Items with the highest factor loadings and items that together resulted in the best fitting model were retained.

When inspecting the means and standard deviations of the need satisfaction items, most items display relatively high means and are negatively skewed (Table 4). The reason for this distribution is likely the high proportion of regularly exercising participants in our sample. Although, the skewness and kurtosis values have a tendency towards non-normality, items do not depart substantially from normality (skewness = 2; kurtosis = 7; see West, Finch, & Curran, 1995). Hence, maximum likelihood (ML) estimates were used. The corrected item-total correlations for each item were in a good range (Field, 2009).

Descriptives and reliability for the three subscales

Table 5 shows the descriptive statistics and Cronbach's alpha values for each of the

three subscales at T1 and at T2. Cronbach's alphas range from .62 (subscale autonomy at T1) to .85 (subscale relatedness at T2). In sum, the internal consistency can be considered as satisfying. The test-retest reliability was assessed nine months after T1. For autonomy it was $r = .54$ ($p < .001$), for competence $r = .61$ ($p < .001$), and r = .61 ($p < .001$) for relatedness. For the total scale PNSEG (11 items) it was $r = .64$ ($p < .001$).

Table 5

Descriptive statistics and Cronbach's alpha (α) for the PNSEG (total score) and the three subscales (T1 and T2)

Scale	*M*	*SD*	α	*n*	n Items
PNSEG (total scale)					
T1	5.25	0.75	.83	568	11
T2	5.18	0.84	.82	202	11
Autonomy					
T1	5.37	0.96	.62	594	3
T2	5.26	1.10	.74	207	3
Competence					
T1	5.45	0.78	.75	583	4
T2	5.32	0.82	.74	204	4
Relatedness					
T1	4.98	1.16	.83	582	4
T2	5.00	1.17	.85	206	4

Note. 7-point response scale: 1 = *I do not agree at all* to 7 = *I very strongly agree*.
PNSEG = Psychological Needs in Exercise Scale – German.

Confirmatory Factor Analysis

First, we randomly divided the T1 sample into two and calculated two one-factor models by allowing all items to load onto one single factor. The fit values indicated that the one-factor solutions did not represent the data well (Table 6). After that, we calculated two CFAs with three factors (autonomy, competence, and relatedness) for the two randomly divided samples. These models showed an adequate datafit, except the TLI in Split Sample 2 (Table 6), which was slightly too low with .89. For split sample 1, the factor loadings ranged from .40 to .83 (Figure 15). The latent factor correlations were .84 (Competence –

Autonomy), .46 (Autonomy – Relatedness), and .53 (Competence - Relatedness). For split sample 2, the factor loadings ranged from .51 to .85 (Figure 15). The latent factor correlations were .82 (Competence – Autonomy), .48 (Autonomy – Relatedness), and .32 (Competence – Relatedness).

Table 6

Fit Indices of the Three-Factor and Alternate CFA Models (T1 and T2).

PNSEG CFA Models	χ^2	*df*	*TLI*	*CFI*	*SRMR*	*RMSEA*	*90%CI*	*AIC*
T1 Sample								
Split Sample (1) (one-factor)	219.44	36	.74	.83	.08	.13	.11-.15	9490.22
Split Sample (1) (two-factor)	76.66	35	.94	.96	.04	.06	.04-.08	9349.55
Split Sample (1) (three-factor)	70.98	33	.94	.96	.04	.06	.04-.08	9347.76
Split Sample (2) (one-factor)	281.17	36	.64	.76	.10	.15	.13-.17	9788.65
Split Sample (2) (two-factor)	113.95	35	.88	.92	.06	.09	.07-.11	9623.43
Split Sample (2) (three-factor)	100.96	33	.89	.94	.05	.08	.07-.10	9614.44
T2 Sample (three-factor)	66.68	33	.92	.95	.05	.07	.05-.90	6576.20

Note. Three-factor models were calculated with 1000 bootstraps requested. The two-factor model comprised autonomy and competence as one single factor, and relatedness as a second. PNSEG = Psychological Needs in Exercise Scale – German.

Due to the rather high latent correlations between autonomy and competence, we calculated a CFA for every subsample with two only latent factors (autonomy and competence as one single factor, and relatedness as a second) instead of three. The datafit (in terms of TLI, CFI etc.) of the models did not improve, or got worse respectively (the AIC) (Table 6). Thus, the two-factor solution can be rejected. In the next step, we calculated a three-factor CFA with the T2 data. The fit indices were in a satisfying range (Table 6) and the latent factor correlations were .82 (Competence – Autonomy), .48 (Autonomy – Relatedness), and .71 (Autonomy – Relatedness). The factor loadings were comparable with the T1 models.

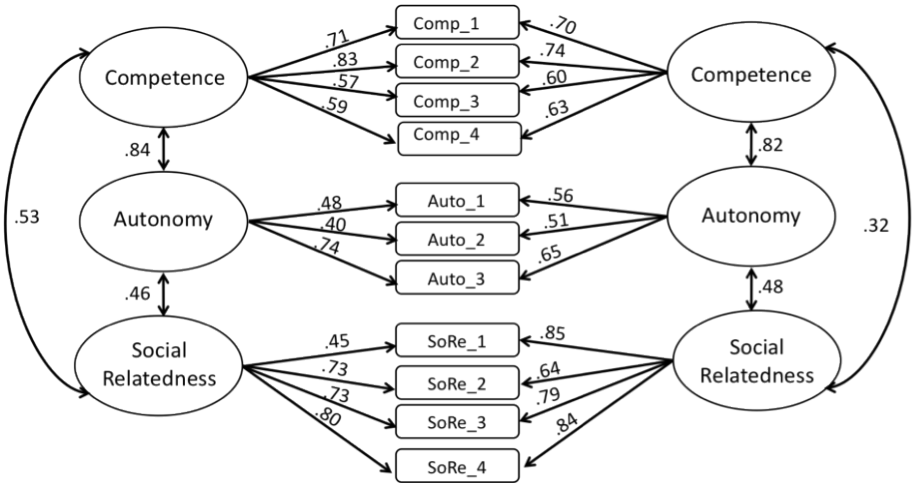


Figure 15. Factor loading of the Split Sample no.1 (on the left; *n* = 304) and Split Sample no. 2 (on the right; *n* = 301) at T1 (standardized solutions). Explanations for abbreviations of the items can be found in Table 4.

Construct validity

The three dimensions of need satisfaction in exercise should correlate substantially positively with similar motives for exercise. For this, we calculated Pearson correlations between the three subscales of the PNSEG and selected motives for exercise. Moreover, for the need for competence we analyzed the correlation with exercise specific self-efficacy. The correlation coefficients are displayed in Table 7 and can be considered as medium to high (Cohen, 1988). For example, the satisfaction of relatedness had the strongest correlations compared to the other two need satisfactions with the motive social. The satisfaction of competence seemed to have the strongest correlation with exercise-specific self-efficacy. All reported correlations showed the expected directions and were significant.

Criterion validity

We hypothesized that intrinsic motivation is associated with flow experience, which implies that need satisfaction of the three basic needs should substantially correlate with flow experience. At T1 the correlations between the PNSEG (total scale), autonomy,

Table 7

Correlations between PNSEG (total score) and the three subscales at T1 and T2 with several scales for criterion and construct validity

	Intercorrelations			Construct Validity					Criterion Validity				
PNSEG and subscales	1	2	3	S.E.	Compt.	Enjoy	Social	Flow	PA	NA	VA	Physic. Exerc. T1	Physic. Exerc. T2
T1													
PNSEG	.74**	.76**	.81**	.38**	.48**	.46**	.50**	.50**	.30**	-.29**	.29**	.28**	.16*
Autonomy (1)	-	.53**	.34**	.29**	.39**	.41**	.14**	.50**	.30**	-.28**	.23**	.25**	.19**
Competence (2)		-	.34**	.42**	.41**	.35**	.13**	.49**	.26**	-.27**	.22**	.27**	.03
Relatedness (3)			-	.23**	.32**	.33**	.69**	.26**	.16**	-.17**	.19**	.15**	.04
T2													
PNSEG	.81**	.82**	.86**	.38**	.55**	.46**	.51**	.41**	.16*	-.24**	.26**	-	.21**
Autonomy (1)	-	.62**	.50**	.37**	.47**	.36**	.17*	.32**	.17*	-.22**	.19**	-	.30**
Competence (2)		-	.52**	.40**	.42**	.39**	.26**	.49**	.16*	-.22**	.24**	-	.15
Relatedness (3)			-	.23**	.46**	.38**	.69**	.26**	.11	-.18*	.23**	-	.11

Note. **p < .01. *p < .05. PA = positive activation; NA = negative activation; VA = valence; S.E. = self-efficacy towards physical exercise; Physic. Exerc. = physical exercise; Enjoy = motive for enjoyment/interest (MPAM-R); Compt. = motive for competence (MPAM-R); Social = motive social (MPAM-R); PNSEG = Psychological Needs in Exercise Scale – German.

and competence with flow can be considered as high. The correlation between relatedness and flow was low (see Table 7)[3].

Since need satisfaction is assumed to be related to well-being, we calculated Pearson correlations between need satisfaction and the PANAVA. The correlations between the total scale ($r = .30$, $p < .001$), and autonomy ($r = .30$, $p < .001$) with PA at T1 were of medium size and significant. Competence and PA correlated with $r = .26$ ($p < .001$) and relatedness and PA correlated with $r = .16$ ($p < .001$) at T1. The correlations between VA and PNSEG, the subscales for the satisfaction of autonomy, competence, and relatedness at T1 show roughly the same directions (Table 7) as with PA. As expected, the scales were negatively correlated with NA at T1 (Table 7)[3].

Moreover, we tested the correlations between the PNSEG subscales and exercise. The correlations between autonomy satisfaction and exercise ($r = .25$, $p < .001$), and competence satisfaction and exercise ($r = .27$, $p < .001$) were of medium effect size whereas the correlation between relatedness satisfaction and exercise was small ($r = .15$, $p < .001$)[3]. To examine the longitudinal associations of need satisfaction for physical exercise, we tested correlations between the PNSEG, the subscales at T1 and exercise at T2 (Table 7). The correlations were smaller than the cross-sectional ones and were only significant for the total scale ($r = .16$, p = .04) and for the subscale autonomy satisfaction ($r = .19$, p = .01). In addition, we conducted two regression analyses with the total scale and the subscale autonomy satisfaction (T1) each serving as independent variable and physical exercise at T2 as dependent variable. Results indicated that the satisfaction of autonomy ($b = 59.14$, $SE\ b = 22.41$, $\beta = 0.19$, $p = .01$, $R^2 = .04$, $F(1, 178) = 6.96$, $p = .01$), as well as the satisfaction of all needs (total scale) ($b = 57.62$, $SE\ b = 27.62$, $\beta = 0.16$, $p = .04$, $R^2 = .03$, $F(1, 172) = 4.35$, $p = .04$) predicted physical exercise at T2. However, after controlling for physical exercise at T1,

[3] Due to limited space, we only report the T1 results; T2 results were very similar and showed the same patterns of associations.

the significant association disappeared and T1 physical exercise remained the only significant predictor for physical exercise at T2.

Finally, via regression analysis we examined how good the participants' motivational style can be predicted by the satisfaction of the three basic needs. Moreover, we were especially interested in the unique contributions of the satisfaction of each basic need for this prediction. We conducted three separate analyses with each subscale of the sport and exercise related self-concordance scale serving as dependent variable and the satisfaction of autonomy, competence, and relatedness each serving as independent variable. The results show that need satisfaction at T1 substantially predicted intrinsic motivation at T2 (Table 8). In line with our expectations, need satisfaction predicted the two autonomous forms of motivation best (intrinsic and identified, Table 8).

Table 8. *Regression analysis for predicting motivational styles (at T2) with the satisfaction of the needs for autonomy, competence, and relatedness (at T1)*

Variables	*B*	*SE B*	β
Intrinsic Motivation at T2			
Autonomy at T1	0.43	0.08	0.39**
Competence at T1	0.06	0.11	0.04
Relatedness at T1	0.24	0.06	0.25**
Identified Motivation at T2			
Autonomy at T1	0.27	0.08	0.27**
Competence at T1	0.01	0.12	0.01
Relatedness at T1	0.04	0.07	0.05
Introjected Motivation at T2			
Autonomy at T1	0.11	0.11	0.08
Competence at T1	-0.19	0.15	-0.12
Relatedness at T1	-0.11	0.09	-0.10
Extrinsic Motivation at T2			
Autonomy at T1	-0.05	0.06	-0.07
Competence at T1	-0.17	0.08	-0.18*
Relatedness at T1	0.11	0.05	0.17*

Note. $R^2_{\text{Intrinsic Motivation}} = 0.29$; $F(3, 195) = 26.95^{**}$; $R^2_{\text{Identified Motivation}} = 0.08$; $F(3, 198) = 5.92^{**}$; $R^2_{\text{Introjected Motivation}} = 0.02$; $F(3, 193) = 1.61$; $R^2_{\text{Extrinsic Motivation}} = 0.05$; $F(3, 196) = 3.31^{*}$.
** $p < .01$. * $p < .05$.

Discussion

This study aimed at translating and validating the PNSEG, a self-report instrument to measure the extent to which the basic needs of autonomy, competence, and relatedness are satisfied while exercising. The results support several psychometric properties of this scale: The factorial composition was tested with two randomly split samples at T1, and the reproducibility of the factor structure has been demonstrated at T2 nine months later. Furthermore, the results show good internal consistency, and satisfying indicators of construct and criterion validity.

The results demonstrated an acceptable to good factor structure with strong loadings of the 11 items to define their respective factor and acceptable fit indices. The correlations between the latent factors were mainly of moderate size, except for the correlations between the satisfaction of autonomy and of competence, which were strong at both T1 and T2. High intercorrelations between subscales of a certain construct could be critically interpreted as a lack of distinctiveness between the scales.

However, as all three subscales belong to the second order factor need satisfaction, moderate to high intercorrelations were to be expected and are in line with the results reported by Vlachopoulos and Michailidou (2006). Moreover, there are differences between the manifest intercorrelations (Table 7) and the latent factor correlations (Figure 15). Latent correlations are assumed to be free of measurement errors (e.g., Geiser, 2010). This is the reason why they are usually higher than manifest correlations and because of this the reported values differ.

We calculated three different models: the first with a one-factor solution; the second with the satisfaction of autonomy and competence as one factor and relatedness satisfaction as a second, and finally a model with all three need satisfactions as three factors. Although the latent factors of the satisfaction of autonomy and competence are relatively highly correlated, the fit indices (Table 6) indicate that the one-factor and the two-factor solutions did not

represent the data well. Thus, we assume that although the three subscales represent the underlying common latent factor need satisfaction, there is additional systematic scale specific variance (e.g., Geiser, 2010) and because of this the assumption of three distinct basic need satisfactions is appropriate. Additionally, distinctiveness of the three subscales is further confirmed by differing results with regard to construct and criterion validity.

The PNSEG total score and the subscale relatedness and competence had good Cronbach´s alpha values at T1 and T2. Only the subscale autonomy satisfaction had a low Cronbach´s alpha value at T1, which was slightly lower than that reported by Domínguez and colleagues (2010) and substantially lower than those reported by others (Wilson et al., 2006; Vlachopoulos & Michailidou, 2006). One important difference between the present scale and those of the other authors is the number of items per subscale. While Wilson and colleagues (2006) included six items per subscale, the present subscale comprised three (for autonomy) or four (for competence and relatedness). As the Cronbach´s alpha values are influenced by the number of items included (Cortina, 1993), this may contribute to the discrepancy between the present and the above-mentioned internal consistencies. Over all, with nearly all values greater than .70 the internally consistency can be evaluated as good (Cortina, 1993).

Domínguez and colleagues (2010) reported test-retest reliabilities of .68 for the satisfaction of relatedness, .70 for autonomy, and .71 for competence after ten weeks. The test-retest reliability of the PNSEG and its subscales was lower but still acceptable, especially when considering the long time span of nine months. Despite these retest-reliability values, the question arises if high stability of need satisfaction can at all be expected, because the social context is described as a possible source of need satisfaction (Ryan & Deci, 2007). Thus, when the social context changes, need satisfaction might change as well. It might be that during the nine months between T1 and T2, the social context concerning exercise changed for some of our participants, which might be a possible explanation of the medium-sized correlations between T1 and T2.

The construct validity of the PNSEG was supported by the correlations between the three basic need satisfactions with the three motives competence, enjoyment/interest, and social. Additionally, the need for competence was correlated with self-efficacy toward physical exercise (Fuchs & Schwarzer, 1994). Especially the subscale relatedness satisfaction and the motive social correlated highly. Vlachopoulos and Michailidou (2006) conducted a structural equation model to test whether need satisfaction could predict enjoyment and interest of exercise. They employed the Enjoyment-Intrinsic Interest subscale from the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) and demonstrated that Enjoyment/Interest could be predicted by autonomy and competence. Relatedness did not significantly contribute to this prediction. We employed the enjoyment/interest subscale of the MPAM-R to demonstrate the similarity between the satisfaction of need for autonomy and the motive enjoyment/interest for exercise. We demonstrated that PNSEG (total score) as well as the autonomy satisfaction subscale were substantially correlated with enjoyment/interest. Contrary to Vlachopoulos and Michailidou (2006), in our study the satisfaction of competence and relatedness were also substantially correlated with enjoyment/interest. This association supports the assumption that the satisfaction of all three basic needs is important for enjoyment and not only the satisfaction of autonomy and competence.

Surprisingly, the subscale competence correlated only with a medium effect size with self-efficacy toward physical exercise. Because of the conceptual similarities of self-efficacy and competence, we expected higher correlations. A possible explanation is that mastery experience, which primarily is requested within the self-efficacy toward physical exercise scale, mainly deals with three facets (psychological state, social and environmental conditions) of barrier management concerning exercising. When comparing the meaning and the content with the satisfaction of need for competence subscale some major differences become evident. The satisfaction of need for competence mainly covers the perceived competence during exercise. Perceived barriers are covered by one single item only. Another

important difference is the different time perspectives included in the scales. The self-efficacy towards exercise scale refers to prospective events that might impede planned exercising. In comparison, the PNSEG-subscale competence refers to mastery and competence experienced while exercising. These differences might be the reason for the medium size relationship.

Several regression analyses were conducted to test how good the perceived satisfaction of psychological needs predicted the participants' motivational style nine months later. As expected the highest amount of explained variance resulted in the prediction of intrinsic motivation. In line with our expectations, need satisfaction of autonomy emerged as an important predictor for intrinsic and identified motivation (Deci & Vansteenkiste, 2004), while the satisfaction of relatedness played an important role in predicting intrinsic and extrinsic motivation. Rather surprisingly is that the satisfaction of competence did not play a role in predicting the autonomous forms of regulation, whereas relatedness was a significant and important predictor for the autonomous forms of regulation. These results are in contrast to results by Deci and Vansteenkiste (2004), who indicated that the satisfaction of relatedness is the least important predictor for intrinsic motivation compared to the other two needs. However, in line with our results is the work by Frodi, Bridges, and Grolnick (1985) that provides some evidence that relatedness can influence intrinsic motivation within children. A possible reason for this contrasting finding might be that we recruited our participants mainly in exercise settings with a high probability that they exercise together. There is evidence that significant others can support the satisfaction of the three basic needs. For example, the role of autonomy support by significant others for the autonomous forms of regulation (e.g., Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) as well as for behavioural intentions concerning exercise (Wilson & Rodgers, 2004) have been well documented by research in the exercise domain. Moreover, relatively fewer studies dealt with competence support by significant others (e.g., Standage, Duda, & Ntoumanis, 2003). In a study by Markland and Tobin (2010) relatedness support was negatively related to external regulation, and support of

all three basic needs was a significant predictor for intrinsic regulation. On the one hand this emphasizes the important role of need satisfaction in general and on the other hand the satisfaction of the need for relatedness emerged as an important (negative) predictor for external regulation. Therefore, future research should focus on different settings to find out how these settings could support the satisfaction of the three basic needs. Particularly, the need for relatedness was missed out in former research.

Our results indicated an association between need satisfaction and flow experience. Similarly, these associations were also found by Kowal and Fortier (1999). While they found the lowest association between flow experience and the satisfaction of autonomy, we found the lowest associations between flow experience and the satisfaction of relatedness. One difference between our study and the study conducted by Kowal and Fortier (1999) is that they executed their study in a team sports setting where the participants had some interaction, which could explain the association between flow and the satisfaction of relatedness.

With regard to well-being, we analyzed the correlations between need satisfaction of the three basic needs and the PNSEG total score with the positive and negative activity measures by the PANAVA (Schallberger, 2000 cited in Rheinberg, 2004), which pointed in the expected directions. In the study by Reis and colleagues (2000) the correlations between competence and relatedness with positive mood were higher than in our sample. However, the correlation between the satisfaction of autonomy and positive mood is comparable to our results. An explanation might be the variation in the settings of these different studies. Reis and colleagues (2000) targeted the interplay of daily well-being and need satisfaction in daily life. In contrast, our participants reported well-being and need satisfaction with regard to their exercise situations. Thus, in the study of Reis and colleagues (2000) a much broader range of situations across a whole day might have led to these higher correlations.

Our results suggested cross-sectional associations between need satisfaction and exercising. At T1 these associations were higher than at T2. These associations were indeed

comparable with results in other studies (Table 7). For example Silva and colleagues (2010) reported correlations of .29 for the satisfaction of autonomy with exercise, and of .18 for the satisfaction of competence with exercise. Additionally general need satisfaction and the satisfaction of autonomy (both at T1) predicted exercising at T2 nine month later. However, after controlling for physical exercise at T1, the significant association disappeared and T1 physical exercise remained the only significant predictor for exercising at T2. One possible explanation for this might be that exercise behaviour between T1 and T2 remained relatively stable ($r_{T1\ T2} = .41$, $p < .001$), as we did not conduct an intervention.

Limitations and further directions

Some limitations need to be acknowledged when interpreting the results. First, findings are limited to healthy adults who engage in exercise either on a regular or irregular basis. For people leading a sedentary lifestyle some items might not be applicable. Second, the Cronbach's alphas of the "Sport and exercise related self-concordance" scale (Seelig & Fuchs, 2006) were very low, thus our conclusions with regard to the criterion validity of the PNSEG should be treated with the appropriate caution. Finally, it remains unclear why the satisfaction of the need for competence was not a significant predictor for the autonomous forms of regulation. Particularly, because other studies usually have reported competence as a significant predictor for autonomous forms of regulation whereas relatedness remained insignificant (e.g., Deci & Vansteenkiste, 2004; Vlachopoulos & Michailidou, 2006). Further studies should thus especially address the requirements for satisfying competence and relatedness during exercise. By comparing individuals who usually exercise alone to individuals who exercise in a group or together with a companion, the different qualities of the satisfaction of the need for relatedness could be examined.

To conclude, the results of our study provided first evidence of the factorial composition and validity of the PNSEG. Being a reliable and valid instrument, the newly

developed scale offers a wide range of applications within sport and exercise psychology in the German speaking countries.

Chapter V

Overall Discussion

1. Overall discussion

Being physically active and exercising is associated with better health (e.g., WHO, 2010). Individuals who engage in physical exercise have a lower mortality risk (Paffenbarger et al., 1993) and an enhanced sense of general well-being (e.g., Schwarzer, 2004). That is why several health organisations present guidelines with recommendations concerning the level, duration, and frequency of physical activity participation (e.g., CDC, 2012; WHO, 2012). Nevertheless, a large number of Swiss inhabitants do not fulfil these recommendations (Lieberherr et al., 2010). Therefore, the investigation and identification of determinants associated with health-related physical-activity participation is still of extraordinary importance.

Psychological determinants of physical-activity participation can be distinguished betweenself-regulation abilities (e.g., Gollwitzer & Sheeran, 2006), for example, as well as determinants of the individuals' social context, such as social support (e.g., Uchino, 2009) or basic need satisfaction (Deci & Ryan, 2000; Markland & Tobin, 2010). Although social support and need satisfaction are well-established determinants for starting with physical activity, as well as for participation and maintenance, there are still several open questions and research gaps, which should be addressed.Social support has mostly been examined in studies applying correlational designs and has not yet been embedded in a comprehensive model of health behaviour change, although prior research suggests that social support is an important determinant for health behaviour and health behaviour change (e.g., Uchino, Uno, & Holt-Lunstad, 1999). Recent findings indicate a relationship between social support and physical activity (e.g., Trost et al., 2002), self-efficacy (e.g., McAuley et al., 2003), and different forms of self-regulation (e.g., Anderson et al., 2006). A further important issue to address is the investigation of different kinds of social support. Compared with perceived social support, *received* social support has been less studied, although it is comprised of actual and concrete support transactions (Boehmer, Luszczynska, & Schwarzer, 2007; Knoll,

Rieckmann, & Kienle, 2007), which are particularly important for health-behaviour change. Although need satisfaction constitutes an important condition for intrinsic motivation for health-behaviour change (in this case exercising), there has not been a German scale to assess exercise specific need satisfaction until now. Therefore, one aim of this dissertation was the construction and validation of such a measure.

The aim of Study 1 was to evaluate the impact of received social support on physical exercising as well as on the volitional mediators of the health action process approach (HAPA; Schwarzer, 2008; see also working model, part 3.1), which were self-efficacy, action control and action planning. The design of Study 1 included both an intervention group and a control group. Thereby, research questions A1, A2 and A3 (see also Chapter II) were addressed. They comprise the time course of physical exercising and received social support, and assume that these time courses are significant for the intervention group, but not for the control group. Furthermore, Study 1 was also carried out in order to address research questions B1 and B2 (see also Chapter III). Hypothesis B1 contains the enabling effects of received social support on physical exercising through the volitional mediators of the HAPA. Moreover, Hypothesis B2 covers the discriminative contribution of received emotional and instrumental social support on this enabling. Again, these processes are assumed to be more pronounced in the intervention group than in the control group.

Study 2 was constructed as a validation study to assess the validity and reliability of the newly designed "German Psychological Need Satisfaction in Exercise Scale" (PNSEG), a scale to measure basic psychological need satisfaction in exercise contexts. In this way, research steps C1 to C5 have been studied (see also Chapter IV).

The major findings are summarised and discussed n the following section.

1.1 Discussion of the major results of the studies

The results of Chapters II and III are summarised and discussed together because they both belong to Study 1.

1.1.1 Study 1. The interplay of received social support with physical exercising and with determinants of self-regulation: an intervention study

The aim of *Study 1* (Chapter II) was to investigate the effect of having a new exercise companion on enhancing physical exercising. In addition, whether this would enhance received emotional and instrumental social support was also tested. A further aim of Study 1 (Chapter III) was to embed received social support into a comprehensive model that explains health behaviour change. Therefore, the HAPA was chosen and received social support was included in the volitional phase (see working model, part 3.1). In so doing, the enabling effects of received social support on physical exercising through self-efficacy, action planning, and self-monitoring (as one facet of action control) were investigated. Furthermore, the objective of Study 1 was to identifythe distinct contributions of the different kinds of received social support (namely emotional and instrumental) on physical exercise as well as on the volitional constructs of the HAPA.

Starting with the results of Chapter II, with regard to exercising, both the intervention group and the control group were able to improve their physical exercising during the time of study. Strictly speaking, therefore, Hypothesis A1 must be rejected as both groups were able to enhance their exercising, not just the intervention group as assumed. Received emotional social support remained stable in the intervention group, but significantly decreased in the control group. The results for instrumental social support showed the same pattern: In the control group, received instrumental social support significantly decreased over time. Thus, Hypotheses A2 and A3 must be rejected as well. This kind of time course was not expected for either instrumental or emotional social support. Instead, we expected that, in the intervention group, the received instrumental social support might increase at the beginning of the study and would remain stable until the end of the studybecause every exercising dyad had found its modus operandi. In contrast, for the control group, we expected the received instrumental social support to remain stable on a low level for the duration of the study

because the control group was not instructed to search for a new exercise companion. However, it seems that having a new exercise companion ensures the maintenance of receiving social support. One possible reason for this result could be that the boosting effect of receiving social support took place in the phase when the participant and his/her exercise companion began to exchange ideas about their new exercising behaviour or began to schedule the specific sports occasions. It is highly likely that this happened in the time period between the T0 and T1 questionnaires when randomized allocation to the two groups took place and participants in the intervention group had the task of finding a new exercise companion. However, we did not collect data in this time period; the next measurement was at T1. At that time, the exercise companions were already exercising together, meaning that participants of the intervention group had already received instrumental and emotional social support. Thus, future research should try to capture the received social support in the phase when the exercise companions congregate, by, for example, applying a daily-diary design during this critical period. Further discussion on the best time point to assess received social support in this study is presented in the section “Discussion of the methodological aspects of the studies”.

Moreover, the assumption of a boosting effect for the intervention group for received social support between T0 and T1 is also supported by this finding due to a significant difference between the intervention group and control group in T1 instrumental social support. When the two new exercise companions had begun making plans when the participant found his/her new exercise companion, respectively, then the instrumental social support, in particular, increased because received instrumental social support covers the functional and tangible aspects of received social support.

Moving on to Chapter III, the first aim was to embed received social support into a comprehensive model that explains behaviour change. Therefore, we chose the HAPA and included social support in the volitional phase. We also chose this approach because other

studies found promising results with regard to the enabling effect of social support on exercising. This enabling or indirect effect of social support on exercising was mediated by self-efficacy (Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993; McAuley, Jerome, Elavsky Marquez, and Ramsey, 2003) , action planning (Molloy et al, 2010) or self-regulation (Anderson, Wojcik, Winett, & Williams, 2006). These are also volitional constructs of the HAPA, and therefore appropriate to include received social support in the volitional phase of the HAPA. Consequently, several path analyses were conducted where received social support was measured at T1, volitional mediators at T2 (four weeks later), and physical exercising at T3 (four weeks after T2).

The second aim of Chapter III was to identify the distinct contributions of the different kinds of social support on physical exercise as well as on the volitional constructs of the HAPA. For the intervention group, our results indicate that the effect of received emotional social support on physical exercise was present for all volitional constructs of the HAPA. In particular, the indirect effect from emotional social support to physical exercise through self-efficacy contributed to the total effect, which is directly in line with the enabling hypothesis of social support (Benight & Bandura, 2004). However, for the control group, emotional social support was neither associated with the volitional constructs of the HAPA nor with physical exercise. Therefore, there was no mediation effect of emotional social support through the volitional constructs of the HAPA on physical exercise. Hypothesis B1 can thus be partly accepted. The enabling effect could be confirmed as we assumed this effect would be stronger for individuals in the intervention group. For individuals in the control group, however, the enabling effect could not be demonstrated. Nevertheless, it must be conceded that, with regard to self-regulation, only the self-monitoring facet enabled physical exercising in the intervention group; there was no mediating effect through the two other facets of self-regulation (awareness of standards and self-regulatory effort), either for the intervention group or for the control group. A closer examination of these results can be found in the

discussion on the methodological aspects of the studies. Interestingly, a different picture emerged for received instrumental social support. In the intervention group, instrumental social support predicted action planning, but was not associated with self-efficacy and self-monitoring. With regard to predictingphysical exercise at T3, only self-efficacy and self-monitoring emerged as significant predictors. No direct or indirect effect of instrumental social support on physical exercise could be demonstrated. In the control group, instrumental social support was neither associated with any of the volitional constructs of the HAPA, nor with physical exercise. Furthermore, neither a direct nor indirect effect of instrumental social support on physical exercise could not be demonstrated. These results reflect the different contributions of received emotional and instrumental social support on the enabling of physical exercising. Therefore, hypothesis B2 can be accepted.

In terms of social support, in general, our findings are in line with findings by McAuley and colleagues (2003) and others (Duncan & McAuley, 1993; Duncan, McAuley, Stoolmiller, & Ducan, 1993). However, our findings extend beyond previous results because they highlight the discriminative contributions of the different kinds of received social support on exercise behaviour. Emotional social support emerged as a significant predictor for all volitional constructs of the HAPA, whereas instrumental social support was only able to predict action planning. The enabling hypothesis, therefore,could only be confirmed for received emotional social support and not for received instrumental social support. These findings were rather unexpected as the idea of finding a new exercise companion to exercise with should have targeted instrumental social support because instrumental social support can be described as concrete and practical assistance (Schwarzer & Knoll, 2011). The intervention and control groups differed from each other with regard to instrumental social support at T1, in such a way that participants in the intervention group reported receiving more instrumental social support. However, this instrumental social support was associated with action planning but not with self-efficacy or self-monitoring at T2. The question arises as to why, with regard

to instrumental social support, the two groups differ at T1. One possible explanation could be that the process of searching for and finding a new exercise companion previously boosted the instrumental social support before the T1 online-questionnaire, which was before the first assessment of social support itself took place. Within this thesis, this topic is addressed in the discussion of Chapter II and again in more detail in the context of the methodological aspects of Study 1.

In terms of enabling, received instrumental social support could not be translated into self-efficacy and self-monitoring, and only to some degree into action planning. In contrast, received emotional social support displayed the expected enabling effects on all three volitional constructs of the HAPA in the intervention group, but not in the control group. It seems that received emotional social support plays a special role for the enabling process. This finding adds further empirical evidence to the special meaning of received emotional social support, which has also been demonstrated in previous studies (e.g., Luszczynska, Boehmer, Knoll, Schulz, & Schwarzer, 2007).

1.1.2 Study 2. The German psychological need satisfaction in exercise scale – validation of a measure of need satisfaction in exercise

The assumption of three basic psychological needs (autonomy, competence, and relatedness) are a core construct within Deci and Ryans self-determination theory (1985; 2000). Need satisfaction is associated with physical exercising (e.g., Wilson & Rodgers, 2006), as well as with the intrinsic motivation for physical exercising (e.g., Ryan & Deci, 2007). Although several scales to assess need satisfaction in exercise already exist (e.g., Gillet, Rosnet, &, Vallerand, 2008; Wilson et al., 2006; Vlachopoulos & Michailidou, 2000), there was no such measure in the German language. Therefore, as described, the aim of Study 2 was to translate, construct, and validate the “German Psychological Need Satisfaction in Exercise Scale” (PNSEG), a self-reporting instrument to measure the extent to which the basic needs of autonomy, competence, and relatedness are satisfied while exercising. The results support

several psychometric properties of this scale: The factorial composition was tested with two randomly split samples at T1, and the reproducibility of the factor structure was demonstrated at T2 nine months later. Furthermore, the results showed good internal consistency and satisfying indicators of construct and criterion validity. In the following, these topics are discussed in more detail.

Dimensionality of the PNSEG

First, two CFA-models were calculated in order to examine the dimensionality of the scale. The first CFA model was calculated as a one-factor solution to take into account that all three subscales should measure the single factor of need satisfaction in exercise. The second model included all three facets of need satisfaction as three distinct factors, as proposed in the literature and in accordance with other scales. The fit indices (Table 6) indicate that the one-factor solution did not represent the data well. The results of the three-factor models demonstrated a good factor structure with strong loadings of the 11 items to define their respective factor and acceptable fit indices. The correlations between the latent factors were mainly of moderate size, except for the correlations between the satisfaction of autonomy and of competence, which were strong at both T1 and T2. High intercorrelations between subscales of a certain construct could be critically interpreted as a lack of distinctiveness between the scales. However, as all three subscales belong to the second order factor of need satisfaction, moderate to high intercorrelations were to be expected and are in line with the results reported by Vlachopoulos and Michailidou (2006). Moreover, there are differences between the manifest intercorrelations (Table 7) and the latent factor correlations (Figure 15). Latent correlations are assumed to be free of measurement errors (e.g., Geiser, 2010); therefore,they are usually higher than manifest correlations and the reported values differ because of this. To ensure, however, the proposed and calculated three-factor solution, we calculated a two-factor model with the satisfaction of autonomy and competence as one factor and relatedness satisfaction as a second based on the findings that autonomy and competence

factors were strongly correlated. The fit indices (Table 6) indicated that the two-factor solution did not represent the data well. Thus, we assumed that although the three subscales represent the underlying common latent factor of need satisfaction, there is additional systematic scale specific variance (e.g., Geiser, 2010). Therefore,the assumption of three distinct basic need satisfactions facets is appropriate.

Reliability of the PNSEG

The PNSEG total score and subscale relatedness and competence had good Cronbach´s alpha values at T1 and T2. Only the autonomy satisfaction subscale had a low Cronbach´s alpha value at T1, which was slightly lower than that reported by Domínguez and colleagues (2010), and substantially lower than those reported by others (Wilson et al., 2006; Vlachopoulos & Michailidou, 2006). One important difference between the present scale and those of the other authors is the number of items per subscale. AlthoughWilson and colleagues (2006) included six items per subscale, the present subscale was comprised of three (for autonomy) or four (for competence and relatedness). The reason for retaining fewer items than the others scales was the results of the item analysis conducted (see also Chapter IV). As the Cronbach´s alpha values are influenced by the number of items included (Cortina, 1993), this may contribute to the discrepancy between the present and the above-mentioned internal consistencies. Over all, with nearly all values greater than .70, internal consistency can be evaluated as good (Cortina, 1993).

Domínguez and colleagues (2010) reported test-retest reliabilities of .68 for the satisfaction of relatedness, .70 for autonomy, and .71 for competence after ten weeks. The test-retest reliability of the PNSEG and its subscales was lower, but still acceptable, especially when considering the long time span of nine months. Despite these retest-reliability values, the question arises whether high stability of need satisfaction can at all be expected because social context is described as a possible source of need satisfaction (Ryan & Deci, 2007). That is, when the social context changes, need satisfaction might change as well. It might be that

during the nine months between T1 and T2, the social context concerning exercise changed for some of our participants, which might be a possible explanation for the medium-sized correlations between T1 and T2.

Construct validity of the PNSEG

Construct validity of the PNSEG was supported by the correlations between the three basic need satisfactions and the three motives (competence, enjoyment/interest, social) of the Motives for Physical Activity Measure-Revised (MPAM-R; Ryan, Frederick, Lepes, Rubio & Sheldon, 1997). The social subscale was used to determine whether participants have social motives to exercise. Motives are no measure of intrinsic or extrinsic motivation (Frederick & Ryan, 1993), but aim to assess "… the satisfaction one gains from engaging in the activity…" (Ryan et al., 1997, p. 336). Consequently, for validating need satisfaction in exercise items, associations with the motives for exercising are indicated. Additionally, the need for competence was correlated with self-efficacy toward physical exercise (Fuchs & Schwarzer, 1994). In particular, relatedness satisfaction subscale and the social motive were highly correlated. Vlachopoulos and Michailidou (2006) formulated a structural equation model to test whether need satisfaction could predict enjoyment and interest of exercise. They employed the Enjoyment-Intrinsic Interest subscale from the Intrinsic Motivation Inventory (IMI; e.g., McAuley, Duncan, & Tammen, 1989) and demonstrated that Enjoyment-Intrinsic Interest could be predicted by autonomy and competence. Relatedness did not significantly contribute to this prediction. Although the IMI and the MPAM-R are different scales, there areanalogies between these two scales with regard to content. For our purposes, it was important that both scales contain a subscale to measure the enjoyment and interest for exercising. Therefore, we employed the enjoyment/interest subscale of the MPAM-R to demonstrate the similarity between the satisfaction of need for autonomy and the enjoyment/interest motive for exercise. We demonstrated that PNSEG (total score) and the autonomy satisfaction subscale were substantially correlated with enjoyment/interest.

Contrary to Vlachopoulos and Michailidou (2006), the satisfaction of competence and relatedness were also substantially correlated with enjoyment/interest in our study. This association supports the assumption that the satisfaction of all three basic needs, not only the satisfaction of autonomy and competence, is important for enjoyment.

The psychological construct of self-efficacy (e.g., Bandura, 1997) and the need for competence are conceptually similar; both cover aspects such as having the ability to interact effectively with the environment or producing successful outcomes on specific tasks in the sense of a mastery experience. Therefore, we employed the self-efficacy toward physical exercise scale (Fuchs & Schwarzer, 1994) to test the criterion validity of the competence subscale, particularly. Surprisingly, the competence subscale was correlated only with a medium effect size with self-efficacy toward physical exercise. We expected higher correlations because of the conceptual similarities between self-efficacy and competence,. A possible explanation is that mastery experience, which is primarily requested within the self-efficacy toward physical exercise scale, mainly deals with three facets (psychological state, social and environmental conditions) of barrier management concerning exercising. When comparing the meaning and the content with the satisfaction of need for competence subscale, some major differences have become evident. The satisfaction of need for competence mainly covers the perceived competence during exercise. Perceived barriers are covered by one single item only. Another important difference is the different time perspectives included in the scales. The self-efficacy towards exercise scale refers to prospective events that might impede planned exercising. In comparison, the PNSEG-subscale of competence refers to the mastery and competence experienced while exercising. These differences might be the reason for the medium-sized relationship.

Criterion validity of the PNSEG

For assessing one aspect of criterion validity, the participants' *motivational style* for exercise (Seelig & Fuchs, 2006) was measured. Need satisfaction is supposed to be associated

with the more self-determined forms of regulation and motivation (e.g., Ryan & Deci, 2007). For this, several regression analyses were conducted to test how well the perceived satisfaction of psychological needs at T1 predicted the participants' motivational style at T2 (nine months later). As expected, the highest amount of explained variance resulted in the prediction of intrinsic motivation (according to Deci and Ryan the most self-determined form of motivation; see also Figure 3 for the self-determination continuum). In line with our expectations, need satisfaction of autonomy emerged as an important predictor for intrinsic and identified motivation (Deci & Vansteenkiste, 2004), whereas the satisfaction of relatedness played an important role in predicting intrinsic and extrinsic motivation (see Figure 3). It was rather surprising that the satisfaction of competence did not play a role in predicting the autonomous forms of regulation, whereas relatedness was a significant and important predictor for the autonomous forms of regulation. These results are in contrast to results by Deci and Vansteenkiste (2004), which indicated that the satisfaction of relatedness is the least important predictor for intrinsic motivation compared to the other two needs. However, our results are in line with the work by Frodi, Bridges, and Grolnick (1985) that provides some evidence that relatedness can influence intrinsic motivation within children. A possible reason for this contrasting finding might be that we recruited our participants mainly in exercise settings with a high probability that they exercise together. Therefore, there is evidence that significant others can support the satisfaction of the three basic needs. For example, the role of autonomy support by significant others in the autonomous forms of regulation (e.g., Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) and for behavioural intentions concerning exercise (Wilson & Rodgers, 2004) have been well documented in the exercise domain. Moreover, relatively few studies have dealt with competence support by significant others (e.g., Standage, Duda, & Ntoumanis, 2003). In a study by Markland and Tobin (2010) ,relatedness support was negatively linked to external regulation and support of all three basic needs was a significant predictor for intrinsic regulation. This emphasizes the

important role of need satisfaction, in general, and reveals the emergence of the need for relatedness as an important (negative) predictor for external regulation. Therefore, future research should focus on different settings to determine how these settings can support satisfaction of the three basic needs, particularly as the need for relatedness was not included in former research.

Another criterion validity indicator of the PNSEG is *flow experience* (e.g., Csikszentmihalyi, 1990) as it is related to intrinsic motivation (Frederick-Recascino, 2002) by means of increased need satisfaction, self-determined motivation, and self-reported exercise (e.g., Russell & Bray, 2009; Vlachopoulos & Michailidou, 2006; Wilson, Rodgers, & Fraser, 2002). Our results indicated a positive association between need satisfaction and flow experience. Similarly, these associations were also found by Kowal and Fortier (1999). Althoughthey found the weakest association between flow experience and the satisfaction of autonomy, we found the weakest association between flow experience and the satisfaction of relatedness. One difference between our study and the study conducted by Kowal and Fortier (1999) is that they executed their study in a team sports setting where the participants had interaction, which could explain the association between flow and the satisfaction of relatedness.

Furthermore, *well-being* also served as an indicator for criterion validity of the PNSEG because SDT presumes that need satisfaction is important for the attainment and maintenance of well-being (Gagné, Ryan, & Bargmann, 2003). To that end, we used the positive and negative activity measures by the PANAVA (Positive Activation [PA], Negative Activation [NA], and Valence [VA], Schallberger, 2005). We analyzed the correlations between need satisfaction of the three basic needs and the PNSEG total score with the positive and negative activity measures by the PANAVA, which pointed in the expected directions. Therefore, it can be concluded that all subscales of the PNSEG, as well as the total score, were positively associated with PA and negatively associated with NA (see Table 7).

With regard to correlations between the PNSEG subscales and PANAVA, in the study by Reis and colleagues (2000), the correlations between competence and relatedness satisfaction with positive mood were higher than in our sample. However, the correlation between the satisfaction of autonomy and positive mood is comparable to our results. An explanation might be the variation in the settings of these different studies. Reis and colleagues (2000) targeted the interplay of well-being and need satisfaction in daily life. In contrast, our participants reported well-being and need satisfaction with regard to their exercise situations. Thus, in the study of Reis and colleagues (2000) a much broader range of situations across a whole day may have led to these higher correlations.

Finally, physical exercising is also an indicator for the criterion validity of the PNSEG, in that need satisfaction is associated with physical exercising because need satisfaction is positively associated with physical exercising (e.g., Vlachopoulos & Michailidou, 2006). Our results suggested positive cross-sectional associations between need satisfaction and exercising. These positive associations were stonger at T1 than = T2 (Table 7), which is indeed comparable with results in other studies. For example Silva and colleagues (2010) reported correlations of .29 for the satisfaction of autonomy with exercise, and of .18 for the satisfaction of competence with exercise. Additionally, general need satisfaction and autonomy satisfaction (both at T1) predicted exercising at T2 nine month later. However, after controlling for physical exercise at T1, the significant association disappeared and physical exercise at T1 remained the only significant predictor for exercising at T2. One possible explanation for this could be that exercise behaviour between T1 and T2 remained relatively stable ($r_{T1\ T2} = .41$, $p < .001$), as we did not conduct an intervention.

1.2. Discussion of the methodological aspects of the studies

In the general discussion of *Study 1*, the best time point for assessing received social support for the first time was discussed. With regard to instrumental social support, two findings were rather unexpected. The first was that the time course of received instrumental

social support in the intervention group remained stable throughout the duration of the study (see also Chapter II). It was expected to increase over time, because exercising together with the new exercise companion should positively affect received instrumental social support. The second surprising finding wasthat, for the intervention group, the enabling effect of received social support on physical exercise through the volitional mediators in the HAPA only worked for received emotional social support, but not for received *instrumental* social support (see also Chapter III, and Figure 5 for the working model for Chapter III). It was assumed that the enabling effect would work equally for received instrumental and emotional social support in the intervention group.

To address these two unexpected findings, it could be conceivedthat assessing received social support at T0 would be good in order to compare with the results at T1. This would have been possible for the assessment of received social support in the control groupbecause those participants were asked to report the received social support provided by a person they already exercised with regardless if it were a regular or irregular basis. However, we were especially interested in the impact of a *new* exercise companion on physical exercise. Therefore participants in the intervention group were given the task of finding a new exercise companion for the duration of study. That is, at T0, the source of the received social support for physical exercise was still non-existent for the participants in the intervention group. Therefore, it would not have been possible to assess the received social support by the new exercise companion. Another possibility would have been to ask the participants at T0 about the expected social support from the exercise companion, but this kind of social support would not have been congruent with the received social support at the time points T1 to T3. Therefore, these answers could not have been compared with the answers participants provided when they actually had been exercising with their respective exercise companion.

A second methodological approach deserves more detailed consideration, namely the weekly assessment of physical exercise and several psychological constructs. There is a possibility that this kind of regular assessment of the target behaviour serves as an intervention itself (e.g., xxx), in that it may strengthen the participant's self-regulatory abilities. Self-monitoring, as one facet of self-regulation, may be enhanced by this weekly assessment approach. Based on comments from the participants, we know that receiving those weekly questionnaires and having something to fill in with regard to their weekly physical exercising (at least swimming with their children once a week) was motivating. In contrast, they reported that when they had nothing to fill out it was experienced as unsatisfactory, for example, when they did not exercise at all in the respective week. This effect may have contributed to the result that both the intervention group and control group were able to enhance their physical exercising. This could be however be criticised as as affecting the intervention too much, thereby producing some kind of bias. However, as this bias would occur in both groups, all participants may have been influenced by this intervening effect of reporting their exercise behaviour weekly. Thus, the intervention group and control group would have had the same initial situation with regard to a possible bias from administering weekly questionnaires.

However, when taking the results of the intervention group reported in Chapter III into account, a slightly different picture emerges. With regard to the enabling effect of received emotional social support via the volitional mediators of the HAPA (self-efficacy, action planning, and action control), self-monitoring was the only significant mediator of the three facets of action control (compared to awareness of standards and self-regulatory effort). Although this enabling effect could not be demonstrated for received instrumental social support, self-monitoring was found to be a significant predictor for physical exercise. These results indicate that there maybe some kind of interplay between the condition of having a new exercise companion and the ability to self-monitor one's own exercise behaviour. For the

control group, self-monitoring was not found to be significant predictor for physical exercisingand received social support of any kind was not associated with self-monitoring.

Nevertheless, such intensive longitudinal designs are considered to be advantageous because they better depict everyday processes than possible when assessing constructs less often (Bolger & Laurenceau, 2013; for further discussion on this topic see this chapter 1.3 “Strengths of the studies”). Furthermore, these approaches offer the opportunity to reduce possible distortive effects in terms of memory bias. Self-report measures (used in both studies for the assessment of physical exercise), among others, are known to be influenced by memory bias (e.g., Kupek, 2002; Shepard, 2003). There are, for example, studies that have demonstrated a reporting bias towards overestimating physical activity when the requested time intervals expand (e.g., Klesges, Heck, Mellon, Fulliton, Somes, & Hanson, 1990). By asking the participants about their physical activity over the previous seven days, instead of longertime intervals, for example, this bias could be reduced. Furthermore, doing this kind of weekly assessment over several weeks (as in our study), a better approximation of the real value of physical exercise can be obtained. Overall, the weekly assessment of physical activity seems to be a good method for measuring physical exercise.

The last methodological aspect to consider is the dyadic perspective. In our study, we only collected data from the recipient of the social support, not from the supporting person. Collecting data from both parts of the exercising dyad would provide insight into the supporting process per se, which means that possible mechanisms could be investigated more precisely. For example, to evaluate if the given support reaches the support recipient as intended. Moreover, a dyadic approach would also make it possible to examine the effects of differences in physical exercise of the support provider on the enabling function of social support. For example, support providers who are themselves inexperienced exercisers might provide less effective support than support providers who have been exercising on a regular basis for a longer period of time. Even from a theoretical point of view, collecting data from

the support recipient and the support provider would be relevant. For example, Bandura describes the SCT as a "model of reciprocal causation" (p. 1175) and therefore, collecting dyadic data may be an adequate approach to depict this reciprocity.

The methodological aspects of *Study 2* are discussed in part 1.1.2 "Discussion of the studies major results" of this chapter as the subject of the chapter was the translation and validation of the PNSEG. Further perspectives are discussed in the following section.

1.3. Strengths of the studies

To the best of our knowledge, *Study 1* was among the first that applied an experimental design with randomized allocation of participants to an intervention group or control group in order to investigate the effects of received exercise-specific social support on physical exercising and the enabling effects of social support. In so doing, we were able to study the supportive effect of a new exercise companion on the physical exercise of the support recipient. This was done to ensure that all individuals in the intervention group had the same starting situation. It can easily be assumed that quite a lot of people who want to either start physical exercising or want to enhance their exercising have already had experiences involving an exercise companion – either on a regular or irregular basis. Therefore, we gave the intervention group the task of finding a new exercise companion. This approach also offers the possibility of gaining further insight into the process of searching for a new exercise companion and of congregating with that person. This is of importance forboth health promotion and prevention purposes, because more and more institutions offer possibilities for finding exercise companions (e.g., "Traininspartnerbörse" by ASVZ [Akademischer Sportverband Zürich], 2013; AOK Sportpartner by AOK [Allgemeine Ortskrankenkasse] Germany 2013; Sportpartner-Börse by Stadt Zürich, 2013) or use the idea of exercising with someone as a type of health-promotion advice (e.g., WHO, 2010). Although offering possibilities of exercising together seems to be an important part of health promoting efforts, the advantages and disadvantages have been studied very little to date.

Study 1 has provided initial evidence of the possible enabling effects of received social support on physical exercising. In the intervention group, received emotional social support, in particular, enabled physical exercising by way of self-efficacy, self-monitoring, and action planning. That is, it did not matter so much how often or regularly the target person and the companion exercised together, but rather it wasmore important that the new exercise companion encouraged and comforted the target person concerning to his/her exercising. In terms of receiving emotional social support, that supports the target person in their effort to exercise. This is an interesting result, because it could be interpreted to mean that the fact of having someone to exercise with was not that important, but rather having someone who stands behind and encourages the target person with regard to physical exercising is more important. This couldserve to reduce the pressure related tofinding a possible time that suits both exercise companions, for example, or concerning other impedingcircumstances with regard to exercising together.

Moreover, two other major benefits are provided by the fact that this study dealt with received social support and investigated the different contributions of instrumental and emotional social support. Compared with perceived social support, received social support is less studied (e.g., Boehmer et al., 2007). In addition to experiencing perceived social support for health behaviour change, which is defined as the perception of potential help from the network (Uchino, 2009), the concrete support an individual receives in terms of his/her plan to change a certain health behaviour is equally important. This is due to the mere fact that changing certain health behaviour involves making several small and mostly very concrete steps towards the intended change, among other things. Thus, the approach to study received social support and its effects on health behaviour seems to be quite suitable. Additionally, our study has been able to give first evidence on the discriminative contributions of received instrumental and emotional support for exercise-specific self-efficacy, self-monitoring, and

action control. This finding highlights the importance of studying the different kinds of received social support separately.

Another strength of our study is the weekly assessment of physical activity and several other psychological constructs (e.g., basic need satisfaction, and short versions of received social support and the volitional constructs of the HAPA). This opens another perspective with regard to statistical analyses beyond the analyses included in this dissertation. This approach offers, the possibility to study the intraindividual processes of physical exercising and its associations with other psychological constructs due to the larger amount of data per person. Furthermore, possible associations between the constructs assessed could be investigated on a weekly basis. That is, possible change in the variables under investigation could be tracked in smaller increments, which contribute to a better understanding of underlying processes and their dynamics.

Turning to *Study 2*, the strengths center around the development of an important new scale in this domain in the German language. Appropriate scales are vital in order to measure target behaviours or aspects thereof. Within the framework of the SDT, need satisfaction is a core construct (Ryan & Deci, 2004) and in recentyears more and more scales have been introduced to assess specialized need satisfaction, such as “in relationships,” for example (e.g., La Guardia, Ryan, Couchman, & Deci, 2000) or “at work” (e.g., Baard, Deci, & Ryan, 2004). Likewise, several scales for the sports and exercise setting have been constructed, which demonstrates a need for such a scale in this domain. To our knowledge, however, there was no German translation and validation for the assessment of need satisfaction as defined in SDT in sport and exercise contexts. Moreover, it seems there is a common practice of translating scales without paying too much attention to validation or contextual issues (e.g., in which context the scale should be used), although these aspects are very important (e.g., Schweizer, 2010). Therefore, the added value of constructing our scale is that no validated

measure of need satisfaction in the context of sport and exercise in German language existed before.

With regard to further applications of the newly developed scale, it can be used for the prediction of intrinsic motivation as well as different types of regulation and of exercising behaviour. A number of studies have provided evidence for the mediating effect of intrinsic motivation of the association of need satisfaction and health behaviour. In essence, higher levels of intrinsic motivation are associated with higher levels of exercising. Thus, one possible application in interventions is boosting intrinsic motivation by need satisfaction.

Study 2 went beyond comparable validation studies (e.g., Vlachopoulos & Michailidou, 2006; Wilson, Rogers, Rodgers, & Wild, 2006) by applying a greater time interval between T1 and T2. From the studies conducted by Vlachopoulos and Michailidou (2006) and Domínguez and colleagues (2010), we know that the longer the time interval between T1 and T2 used to determine the test-retest reliability, the smaller the correlations. This is not surprising because need satisfaction depends on the individuals' social context (Ryan & Deci, 2007). That is, when the social context changes, need satisfaction may conceivably change as well. In our study, the test-retest correlations between T1 and T2 were around .60, compared to the study by Domínguez and colleagues (2010), in which they were around .70. Against the background of the nine-month time span in our study compared to the ten-week time span in the study by Domínguez and colleagues, this result indicates that the satisfaction of the three basic needs in exercise may be stable to a certain degree. This result serves to raise the question of the stability of need satisfaction and is an excellent starting point for further investigation into the circumstances under which need satisfaction remains relatively stable over time. To speculate, perhaps this stability of need satisfaction in exercise is an indicator for exercise adherence. Our participants were individuals who mainly exercised on a regular basis and could be categorized as advanced and experienced in terms of their exercising. In future research, the PNSEG could be used to investigate the basic need

satisfaction in exercise in individuals who start with exercising or individuals who exercise on an irregular basis. In this way, it would be possible to compare the extent of basic need satisfaction of the regular exercisers with the extent of need satisfaction of the irregular exercisers. Moreover, as exercise-related need satisfaction is a predictor of intrinsic motivation for exercise, this study approach would allowformaking comparisons between advanced and new exercisers regarding their intrinsic motivation and exercise adherence. This would also make it possible to draw inferences on physical exercise adherence and use this for intervention design.

Finally, from a methodological point of view, the selection of measures used for validation purposes is another major advantage of Study 2. We mainly used two criteria to select appropriate scales and measures to validate the PNSEG. The first criterion was that the measures should be the same or at least comparable to the ones utilized by Vlachopoulos and Michailidou (2006) or Wilson and colleagues (2006). We did so to ensure that nearly the same criteria were employed to estimate the quality of the PNSEG. The second criterion was the availability of validated German scales for the respective measures. This was decided in order to assure that the implications we have drawn were on a stable basis for future research and for further applications of the PNSEG. In general, we succeeded in finding and using such scales and measures.

1.4 Implications for future research

With regard to *Study 1*, some limitations and implications for future research need to be addressed. Our idea was to recruit participants who wanted to enhance their physical exercise. This was successful because participants in both the intervention group and the control group were able to improve their physical exercising during the time of the study. However, our participants reported relatively high exercise levels at T1, which raises the question whether our results are applicable for persons who do not exercise at all. This limitation is in line with another study constraint: Due to the recruitment process, it might be

possible that our participants had rather high intentions of enhancing their physical exercise from the beginning of the study. For future research, it should be considered to recruit participants that have lower intentions to exercise at the beginning of the study. It could be assumed that the associations between social support and the volitional mediators would change and that the effects of the different kinds of social support could be different. In this study, emotional social support played an important role. It might be that individuals who are already engaged in exercising on a relatively regular basis, and whose aim was to enhance exercising instead of beginning to exercise, benefit more from received emotional social support, in terms of encouragement, than from instrumental social support. As described, instrumental social support comprises "concrete assistance". With regard to physical exercise, it could mean "exercising together" but also offering concrete ideas to help the individual to engage in the intended behaviour. It might be that this concrete assistance relating to physical exercise is more important for individuals who are still in the phase of developing their exercise regimen, rather than those who are in the phase of maintaining their exercise habits.

From the descriptive findings of Study 1 (Chapter II), we obtained further insights regarding the interval of measurement time-points. When inspecting the time course of physical exercising from T0 to T3 (Figure 10), there seemed to be a slight increasing trend of physical activity in the intervention group, whereas in the control group, this trend seemed to slightly decrease. The growth-curve model suggested an increase of physical activity in both groups, but these descriptive results indicate that it conducting a follow up measure at a later time point would be promising, for example,three months later. In so doing, the long-term time-course could be assessed and associated with the instance whetherboth exercise companions were still exercising together, for example.

Another limitation is related to the high dropout rates between the first (T0) and second (T1) points of measurement. However, the fact that the number of participants who declined participation is equal in the control and intervention groups indicates that withdrawal

may not be due to the condition of searching for a news exercise companion, but to other reasons. When taking a closer look at the dropout rates from T1 to T3, we again lost nearly half of our participants in both groups. This is a well-documented problem in longitudinal studies and the reason we decided to offer incentives for regular participation, and this might have had an accumulated effect because of the weekly monitoring questionnaires. From participants' comments we assume that some individuals experienced this as too time-consuming and rather burdening. Nevertheless, the advantage of using intensive longitudinal designs (defined as more than five measurement time-points by Bolger & Laurenceau, 2013; see also above under "Strengths of the studies") is capturing everyday processes and developments in the individual's natural context to which they are accustomed (Bolger & Laurenceau, 2013). To deal with the relatively high dropout rate, we used an appropriate method of missing data imputation (Graham, 2009).

As a natural part of planning this study and the recruitment process, we tried to assure the participants' commitment using several approaches. With the diverse modes of recruitment (online-questionnaire, paper-and pencil) and the very different recruitment places and occasions (e.g., via health related websites, flyers to display in group practices, information booth in a research institute, etc.), we tried to assure attracting a heterogeneous sample of individuals who wanted to begin or increase their exercising. One possible disadvantage of such an approach is that possible participants were perhaps not committed enough to fill in all ten questionnaires. Nevertheless, we tried to assure participants' commitment by offering incentives for participation (30 CHF vouchers), by sending personalized preliminary reports of study results, and by sending weekly reminders for filling out the questionnaires. Moreover, we offered the possibility of e-mailing us and we regularly answered possible questions and tried to assist in solving problems our participants were faced with regarding study participation (e.g., questions about internet set ups etc.). The relatively high dropout rate and the difficulties in attracting an appropriate sample reflect

perhaps a more general problem in applied psychological research, which is to find and keep possible participants, particularly for longer and relatively time-consuming projects like this study. Another issue associated with the relatively small sample size is that some statistical analyses, which comprise comparing subgroups of participants, for example, could not be calculated.

The next characteristic of Study 1 that requires a cloer look is the new exercise companion. Our participants were free to choose their exercise companion as long as this companion remained the same person during the eight weeks of the intervention. Thus, the source of social support in terms of the function for the respective person was different for each and every participant, which means thatsome of our participants exercised with a spouse, others with a best friend, others with a colleague. From other studies we know that the source of social support is associated with the support quality. For example, in their meta-analysis, Carron et al. (1996) demonstrated that spousal social support is very effective when the physical exercise the target person performs is externally motivated, for example, recommended by a health professional. However, when the target person wants to maintain his/her exercise behaviour by his/her own initiative, the important others in terms of friends and colleagues are more important than family social support. Additionally, van Stralen et al. (2009) found that, in their literature review on physical activity determinants in older adults, family social support is especially important when the target person wants to begin with being physically active. However, when the target person wants to maintain his/her physical activity, the support of health care providers, sport instructors and exercise group members seems to be the better predictor for future physical activity. Therefore, it is important to investigate the different facets of different sources of support and under which circumstances and whose support is best for physical exercising. There are, for example, several advantages and disadvantages of the spouse being the exercise companion. There is a higher likelihood that this person is more available for possible physical activities compared to a friend or a

working colleague. From commentaries of our participants, we know that one main reason for not exercising together as intended was lack of time. Other frequently reported reasons to choose someone as a new exercise companion were living in the same place and conditions concerning having the same schedule, among others. Moreover, having the same interests with regard to sport and exercising was another important point mentioned by our participants. Overall, the reported reasons would rather speak in favour of choosing the spouse as an exercise companion, but if someone usually does a lot of leisure time activities with his/her spouse anyway, having the spouse as an exercise companion might represent too many shared activities with the spouse. Furthermore, when taking into account that one person has the desire to enhance physical exercising, then this person might experience the shared physical activity as too controlling or have the impression of losing his/her autonomy. Therefore, finding someone other than the spouse to be the exercise companion might be preferable, but it is also associated with other challenges. For example, finding a person that is willing to exercise with the target person; or finding an appointment that is suitable for both, etc. In conclusion, in order to take a closer look at the contribution of different sources of social support on physical exercise, future research should either hold the source of social support constant (e.g., always the spouse is the support provider), or study larger samples in order to obtain subgroups of different support sources to then be able to analyse them independently. Additionally, further investigation into the kind of sports both companions engage in could be of importance. It may be that some kinds of sport are better suited for this kind of social support intervention.

Some limitations need to be acknowledged when interpreting the results of *Study 2.* First, the findings are limited to healthy adults who engage in exercise either on a regular or irregular basis. For people leading a sedentary lifestyle, some items might not be applicable. Second, the Cronbach's alphas of the "Sport and exercise related self-concordance" scale (Seelig & Fuchs, 2006) were very low, thus our conclusions with regard to the criterion

validity of the PNSEG should be treated with the appropriate caution. Finally, it remains unclear why the satisfaction of the need for competence was not a significant predictor for the autonomous forms of regulation, especially because other studies usually have reported competence as a significant predictor for autonomous forms of regulation, whereas relatedness remained insignificant (e.g., Deci & Vansteenkiste, 2004; Vlachopoulos & Michailidou, 2006). Further studies should thus address the requirements for satisfying competence and relatedness during exercise in particular. In addition, it could be worthwhile to examine the different qualities of the satisfaction of the need for relatedness by comparing individuals who usually exercise alone to individuals who exercise in a group or together with a companion..

As previously mentioned, social contexts could be distinguished by their possibility to support need satisfaction. This quality of an individuals' social context can be called "need support" (Markland & Tobin, 2010; Niemiec et al., 2006). With the newly developed PNSEG, the need supportive potential of a particular social context and social relationships can be now investigated appropriately. In line with this, Ryan and Solky (1996) combined the concept of social support with the three basic needs of autonomy, competence, and relatedness assumed in SDT. They indicated that the satisfaction of autonomy and relatedness, in particular, could be facilitated by social support. Furthermore, they stated that this social support should be given in an autonomy- or need-supportive manner in order to ensure the positive and supporting effect. This idea is an excellent starting point to apply the newly developed PNSEG and combine it with the assessment of received exercise specific social support. In so doing, the supportive potential of an individual's social context could be examined in terms of supporting or undermining the exercise abilities of the target person. With regard to the different sources of social support discussed above, the PNSEG now offers the possibility to assess the degree of need satisfaction associated with different persons that support the target

person in terms of his/her physical exercising. In this way, the different support qualities can be investigated more appropriately.

Moreover, in a second step, this concept could be used to develop interventions that include receiving social support in order to elaborate the need supportive potential of the received social support.

2. General conclusions and implications for practice

In general, the aim of this dissertation was to further investigate several social determinants of physical exercise participation. Therefore, *Study 1* investigated the impact of received emotional and instrumental social support on physical exercising (Chapter II), and on the volitional mediators (self-efficacy, action planning, and action control) of the health action process approach (HAPA; Schwarzer, 2008) (Chapter III). Study 1 comprised a longitudinal intervention and control group design. The target of *Study 2* was basic need satisfaction in exercise, which is important for physical exercise participation per se, and for intrinsic motivation for exercise participation. More precisely, Study 2 was a validation study for the newly developed PNSEG ("German Psychological Need Satisfaction in Exercise Scale").

With regard to *Study 1* the results of this dissertation have shown that:

1. Conducting the intervention provided evidence that received emotional social support could partly be embedded in the volitional phase of the HAPA. This is an excellent starting point for the further investigation of social determinants in the HAPA.
2. The intervention showed that emotional social support enabled physical exercising via indirect effects of self-efficacy, self-monitoring, and action planning. This enabling effect was mainly mediated via self-efficacy. That is, having a new exercise companion promotes sport specific self-efficacy and this, in turn, fosters physical exercise engagement.

3. Having a new exercise companion can help to initiate and enhance exercise behaviour. Thus, the social support intervention countered the impact of past exercise behaviour and enabled new exercise behaviour.
4. As implication for practice, the results of Study 1 suggest that exercising together is a promising approach to affect the psychological determinants of physical exercise. Organisations that recommend exercising together as having a positive affect on physical activity could also include a positive effect on the psychological determinants for exercise engagement.
5. The weekly assessment of physical exercising was found to be beneficial for physical activity enhancement in cases where the target group already had the intention to enhance exercising. Likewise, keeping an exercise diary when one wants to enhance exercising could be recommended.

With regard to *Study 2,* the results of our study provided first evidence of the factorial composition and validity of the PNSEG. Being a reliable and valid instrument, the newly developed scale offers a wide range of applications within sport and exercise psychology in the German speaking countries.

References

Abraham, C. & Michie, S. (2008). A taxonomy of behavior change techniques used in interventions. *Health Psychology, 27,* 379-387. doi:10.1037/0278-6133.27.3.379

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes 50*, 179–211. doi:10.1016/0749-5978(91)90020-T

American College of Sports Medicine [ACSM] (2010, 11, 09). Physical Activity and Public Health Guidelines [Website]. Retrieved from http://www.acsm.org/AM/Template.cfm?Section=Home_Page&TEMPLATE=CM/HTMLDisplay.cfm&CONTENTID=7764

Anderson, E. S., Wojcik, J. R., Winett, R. A., & Williams, D. M. (2006). Social-cognitive determinates of physical activity: The influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. *Health Psychology, 4*, 510-520. doi:10.1037/0278-6133.25.4.510

Allgemeine Ortskrankenkassen [AOK] (2013, 01, 02). AOK Sportpartner [Website]. Retrieved from http://www.aok.de/portale/bundesweit/sportpartner/html/

Arbuckle, J. L. (1996). Full information estimation in the presence of incomplete data. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modeling* (pp. 243–277). Mahwah, NJ: Erlbaum.

Akademischer Sportverband Zürich [ASVZ] (2012, 12, 29). Academics Sports Association Zurich [Website]. Retrieved from http://portal.asvz.ethz.ch/english/Seiten/default.aspx

Akademischer Sportverband Zürich [ASVZ] (2013 ,01, 02). Trainingspartner suche [Website]. Retrieved from http://portal.asvz.ethz.ch/boerse/Seiten/trainingspartner_suche.aspx

Aufmuth, U. (1989). Sport und Risiko: Das Beispiel des Extrembergsteigens [Sport and risk: The example of extreme mountaineering]. In K. Dietrich & K. Heinemann (Eds.), *Der*

nicht-sportliche Sport. Beiträge zum Wandel im Sport. Jesteburg, Germany: XOX Burmeister & Dietrich.

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Apllied Social Psychology, 34*, 2045-2068. doi:10.1111/j.1559-1816.2004.tb02690.x

Bandura, A. (1986). *Social foundations of thought and action. A social cognitive theory*. Englewood-Cliffs, NJ, USA: Prentice-Hall.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44,* 1175-1184. doi:10.1037/0003-066X.44.9.1175

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational behavior and human decision processes, 50*, 248–287. doi:10.1016/0749-5978(91)90022-L

Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Direction in Psychological Science, 9*, 75-78. doi:10.1111/1467-8721.00064

Baumann, A. E. (2004). Updating the evidence that physical activity is good for health: An epidemiological review 2000-2003. *Journal of Science and Medcine in Sport, 7* (Suppl.), 6–19. doi:10.1016/S1440-2440(04)80273-1

Baumeister, R. & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529. doi:10.1037/0033-2909.117.3.497

Benight, C. C. & Bandura, A. (2004). Social cognitive theory of posttraumatic recovery: the role of perceived self-efficacy. *Behaviour Research and Therapy, 42*, 1129–1148. doi:10.1016/j.brat.2003.08.008

Berkman, L. F., Leo-Summers, L., & Horwitz, R. I. (1992). Emotional support and survival after myocardial infarction. A prospective, population-based study of the elderly. *Annals of Internal Medicine, 117*(12), 1003-1009.

Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: A

nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology, 109*(2), 186-204.

Berlin, J. A. & Colditz, G., A. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology, 132*(4), 612-628.

Biddle, S. J. H., & Mutrie, N. (2001). *Psychology of physical activity: Determinants, well-being and interventions*. London, England: Routledge.

Boehmer, S., Luszczynska, A. & Schwarzer. R. (2007). Coping and quality of life after tumor surgery: Personal and social resources promote different domains of quality of life. *Anxiety, Stress & Coping: An international journal, 20,* 61-75. doi:10.1080/10615800701195439

Bolger, N., & Laurenceau, J. P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research.* New York, NY, USA: Guilford Press.

Booth, M. L. (2000). Assessment of physical activity: An international perspective. *Research Quarterly for Exercise and Sport, 71*(2), 114-120.

Bouchard, C., & Shephard, R. J. (1994). Physical activity, fitness and health: The model and key concepts. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.), *Physical activity, fitness and health* (pp. 77–88). Champaign, IL, USA: Human Kinetics.

Brehm, W., & Eberhardt, J. (1995). Drop-out und Bindung im Fitness-Studio [Drop-out and retention in the fitness center]. *Sportwissenschaft, 25,* 174–186.

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology, 1*, 185-216. doi:10.1177/135910457000100301

Bühner, M. (2006). *Einführung in die Test- und Fragebogenkonstruktion* [Introduction to test construction and measurement]. München, Germany: Pearson Education.

Burkert, S., Scholz, U., Gralla, O., Roigas, J., & Knoll, N. (2011). Dyadic planning of health-behavior change after prostatectomy: A randomized-controlled planning intervention. *Social Science & Medicine, 73*, 783-792. doi:10.1016/j.socscimed.2011.06.016

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York, NY, USA: Cambridge University Press.

Carron, A. V., Hausenblas, H. A., & Mack, D. (1996). Social influence and exercise: a meta-analysis. *Journal of Sport & Exercise Psychology, 18*(1), 1-16.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126-131.

Cavill, N., Kahlmeier, S., & Racioppi, F. (Eds.). (2006). *Physical activity and health in Europe: Evidence for action*. Copenhagen, Denmark: World Health Organization Regional Office for Europe. Retrieved June, 1, 2011 from http://www.euro.who.int/__data/assets/pdf_file/0011/87545/E89490.pdf

Centers for Disease Control and Prevention [CDC] (2012, 12, 10). *Physical activity for everyone.* How much physical activity do adults need? [Website]. Retrieved from: http://www.cdc.gov/physicalactivity/everyone/guidelines/adults.html

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ, USA: Lawrence Erlbaum.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*, 98-104. doi:10.1037/0021-9010.78.1.98

Courneya, K.S., Plotnikoff, R.C., Hotz, S.B., & Birkett, N.J. (2000). Social support and the theory of planned behavior in the exercise domain. *American Journal of Health Behavior, 24*, 300-308. doi: 10.5993/AJHB.24.4.6

Craig, C. L., Marshall, A.L., Sjöström, M., Baumann, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35*, 1381-1395. doi:10.1249/01.MSS.0000078924.61453.FB

Crayen, C. (2010). *Chi-square distributions calculator* (*Version 3)* [Computer software]. Berlin, Germany: Freie Universität.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York, NY, USA: Harper and Row.

DeCharms, R. (1968). *Personal causation: The internal affective determinates of behavior*. New York, NY, USA: Academic Press.

Deci, E. L. (1975). *Intrinsic Motivation*. New York, NY, USA: Plenum.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and self-determination in behavior.* New York, NY, USA: Plenum.

Deci, E. L. & Ryan, R. M (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268. doi:10.1207/S15327965PLI1104_01

Deci, E. L. & Vansteenkiste, M. (2004). Self-determination theory and basic need satisfaction: Understanding human development in positive psychology. *Ricerche di Psicologia, 27*(1), 17-34.

Domínguez, E., Martín, P., Martín-Albo, J., Núñez, J. L., & León, J. (2010). Translation and validation of the Spanish version of the "échelle de satisfaction des besoins psychologiques" in the sports context. *The Spanish Journal of Psychology, 13 (2)*, 1010-1020.

Duncan, T. E., & McAuley, E. (1993). Social support and efficacy cognitions in exercise adherence: A latent growth curve analysis. *Journal of Behavioral Medicine, 16*(2), 199–218. doi:10.1007/BF00844893

Duncan, T. E., McAuley, E., Stoolmiller, M. & Duncan, S. (1993). Serial fluctuations in exercise behavoir as a function of social support and efficacy. *Journal of Applied Social Psychology, 23*, 1498-1522. doi:10.1111/j.1559-1816.1993.tb01045.x

Dunton, G., Berrigan, D., Ballard-Barash, R., Graubard, B., & Atienza, A. (2009). Environmental influences on exercise intensity and duration in a U.S. time use study. *Medicine & Science in Sports & Exercise,* 1698-1705. doi:10.1249/MSS.0b013e3181a06c9b

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*, 240-2265. doi:10.1111/j.0021-9029.2006.00102.x

Engeser, S., & Rheinberg, F. (2008). Flow, performance and moderators of challenge-skill balance. *Motivation and Emotion, 32*, 158 -172. doi:10.1007/s11031-008-9102-4

European Sports Charter (2001). Recommendation Nr. R (92) 13 REV of the committee of ministers to member states on the revised european sports charter [website]. Retrieved December 10, 2012, from https://wcd.coe.int/ViewDoc.jsp?id=206451

Field, A. (2009). *Discovering statistics using SPSS*. Los Angeles, CA, USA: Sage.

Fischer Aggarwal, B. A., Liao, M., & Mosca, L. (2008). Physical activity as a potential mechanism through which social support may reduce cardiovascular disease risk. *Journal of Cardiovascular Nursing, 23*, 90-96. doi:10.1097/01.JCN.0000305074.43775.d8

Frederick-Recascino, C. M. (2002). Self-determination theory and participation motivation research in the sport and exercise domain. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 277–294). Rochester, NY, USA: The University of Rochester Press.

Frederick, C. M., & Ryan, R. M. (1993). Differences in motivation for sport and exercise and their relationships with participation and mental health. *Journal of Sport Behavior*, *16*(3), 125-145.

Frodi, A., Bridges, L., & Grolnick, W. (1985). Correlates of mastery-related behaviour: A short-term longitudinal study of infants in their second year. *Child Development, 56*, 1291-1298. doi:10.2307/1130244

Fuchs, R. (2003). *Sport, Gesundheit und Public Health [Sports, physical health and public health]*. Göttingen, Germany: Hogrefe.

Fuchs, R. & Schwarzer, R. (1994). Selbstwirksamkeit zur sportlichen Aktivität: Reliabilität und Validität eines neuen Messinstruments [Self-efficacy and exercise: Reliability and validity of a new measure]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 15*(3), 141-154.

Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion, 27*(3), 199–223. doi:10.1023/A:1025007614869

Gagné, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology, 15*, 372-390. doi:10.1080/714044203

Gauvin, L., Rejecski, W. J., Norris, J. L. & Lutes, L. (1997). The curse of inactivity: failure of acute exercise to enhance feeling states in a community sample of sedentary adults. *Journal of Health Psychology, 2,* 509–523. doi:10.1177/135910539700200408

Geiser, C. (2010). *Datenanalyse mit Mplus. Eine anwendungsorientierte Einführung* [Data analysis with Mplus. An application-oriented introduction]. Wiesbaden, Germany: VS Verlag.

Gellert, P., Ziegelmann, J. P., Warner, L. M., & Schwarzer, R. (2011). Physical activity intervention in older adults: does a participating partner make a difference? *European Journal of Aging, 8*, 2011-219. doi:10.1007/s10433-011-0193-5

Giles-Corti, B. & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine, 54*, 1793-1812.doi:10.1016/S0277-9536(01)00150-2

Gillet, N., Rosnet, E., & Vallerand, R. J. (2008). Développement d'une échelle de satisfaction des besoins fondamentaux en contexte sportif. *Canadian Journal of Behavioural Science, 40*, 230-237. doi:10.1037/a0013201

Glenister, D. (1996). Exercise and mental health: a review. *Journal of the Royal Society of Health, 116,* 7–13. doi:10.1177/146642409611600102

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*, 493-503. doi:10.1037/0003-066X.54.7.493

Gollwitzer, P. M. & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73*, 186-199. doi:10.1037/0022-3514.73.1.186

Gollwitzer, P. M. & Sheeran, P. (2006). Implementation intentions and goal achievement: a meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69-119. doi:10.1016/S0065-2601(06)38002-1

Golz, N., Erkelens, M., & Sack, H.-G. (1990). Ein erlebnisorientiertes Sportprogramm zur Behandlung von Depressionen. Theoretische Grundlagen und empirische Ergebnisse [An experience-based sports programme for the therapy of depression. Theory and empirical findings]. *Report Psychologie, 44*, 12–19.

Graham, J.W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology, 60*, 549-576. doi:10.1146/annurev.psych.58.110405.085530

Haber, M. G., Cohen, J. L., Lucas, T. & Baltes, B. B. (2007). The relationship between self-reported received and perceived social support: A meta-analytic review. *American Journal of Community Psychology, 39*, 133-144. doi:10.1007/s10464-007-9100-9

Hagger, M. S., Chatzisarantis, N. L. D., Culverhouse, T., & Biddle, S. J. H. (2003). The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behaviour: a transcontextual model. *Journal of Educational Psychology, 95*, 784–795. doi:10.1037/0022-0663.95.4.784

Hänsel, F. (2007). Körperliche Aktivität und Gesundheit [Physical activity and health]. In R. Fuchs, W. Göhner, & H. Seelig (Eds.), *Aufbau eines körperlich aktiven Lebensstils* (pp. 23–44). Göttingen, Germany: Hogrefe.

Hardman, A. E., & Stensel, D. J. (2003). Physical activity and health: The evidence explained. London, England: Routledge.

Heckhausen, H. (1991). *Motivation and action.* Berlin, Germany: Springer.

Holt-Lunstad, J., Smith, T.B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7, e1000316*, doi:10.1371/journal.pmed.1000316

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241*(4865), 540–545. doi:10.1126/science.3399889

Hoyle, R. H. (2011). *Structural equation modelling for social and personality psychology*. London, England: Sage.

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi:10.1080/10705519909540118

Hull, C. L. (1943). *Principles of behavior: An introduction to behavior theory*. Oxford, England: Appleton-Century.

Klesges, R. C., Heck, L. H., Mellon, M. W., Fulliton, W., Somes, G. W., & Hanson, C. L. (1990). The accuracy of self-reports of physical activity. *Medicine & Science in Sports & Exercise, 22,* 690-697. doi:10.1249/00005768-199010000-00022

Knoll, N., Rieckmann, N. & Kienle, R. (2007). The other way around. Does health predict perceived support? *Anxiety, Stress and Coping, 20*, 3-16. doi:10.1080/10615800601032823

Koestner, R., & Losier, G. F. (2002). Distinguishing three ways of being highly motivated: A closer look at introjection, identification, and intrinsic motivation. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 101–121). Rochester NY, USA: University of Rochester Press.

Kouvonen, A., De Vogli, R., Stafford, M., Shipley, M. J., Marmot, M.G., Cox, M., Vahtera, J., Väänänen. A., Heponiemi, T., Singh-Manoux, A., & Kivimäki, M. (2011). Social support and the likelihood of maintaining and improving levels of physical activity: the Whitehall II Study. *European Journal of Public Health, 22*, 514-518. doi:10.1093/eurpub/ckr091

Kowal, J. & Fortier, M. S. (1999). Motivational determinates of flow: Contributions form self-determination theory. *The Journal of Social Psychology, 139*, 355-368. doi:10.1080/00224549909598391

Kupek, E. (2002). Bias and heteroscedastic memory error in self-reported health behavior: An investigation using covariance structure analysis. *BMC Medical Research Methodology, 2*, 14. doi:10.1186/1471-2288-2-14

Lachman, M. E., Neupert, S.D., Bertrand, R. Jette, A. M. (2006). The effects of strength training on memory in older adults. *Journal of Aging and Physical Activity, 14*(1), 59-73.

La Guardia, J. G., Ryan, R. M., Couchman, C. E. & Deci, E. L. (2000). Within-person variation in security of attachment: A self-determination theory perspective on attachment, need fulfilment, and well-being. *Journal of Personality and Social Psychology, 79,* 367-384. doi:10.1037/0022-3514.79.3.367

Lamprecht, M., Fischer, A., & Stamm, H. (2008a). *Sport Schweiz 2008. Das Sportverhalten*

der Schweizer Bevölkerung [Sport Switzerland 2008. The sports behavior of the Swiss public]. Magglingen, Switzerland: Bundesamt für Sport BASPO.

Lamprecht, M., Fischer, A., & Stamm, H. (2008b). *Sport Schweiz 2008. Kinder- und Jugendbericht [Sport Switzerland 2008. Report on children and youth]*. Magglingen, Switzerland: Bundesamt für Sport BASPO.

Legge, S., Davidov, E., & Schmidt, P. (2008). Social structural effects on the level and development of the individual experience of anomie in the German population. *International Journal of Conflict and Violence, 2*, 248-267.

Lieberherr, R., Marquis, J.-F., Storni, M., & Wiedenmayer, G. (2010). *Gesundheit und Gesundheitsverhalten in der Schweiz 2007. Schweizerische Gesundheitsbefragung [Health and health-related behavior in Switzerland 2007. Swiss health survey]*. Neuchatel, Switzerland: Bundesamt für Statistik (BFS).

Lippke, S. (2004). The role of social support in adherence processes following a rehabilitation treatment. *Journal of Psychosomatic Research, 56*(6), 615. doi:10.1016/j.jpsychores.2004.04.178

Locke, E. A., & Lathan, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ, USA: Prentice-Hall.

Luszczynska, A. & Schwarzer, R. (2003). Planning and self-efficacy in the adoption and maintenance of breast self-examination: A longitudinal study on self-regulatory cognitions. *Psychology and Health, 18*, 93-108. doi:10.1080/0887044021000019358

Luszczynska, A., Boehmer, S., Knoll, N., Schulz, U. & Schwarzer, R. (2007). Emotional support for men and women with cancer: do patients receive what their partners provide? *International Journal of Behavioral Medicine, 14*(2)*,* 156–163

Manzoli, L., Villari, P., Pirone, G. & Boccia, A. (2007). Marital status and mortality in the elderly: A systematic review and meta-analysis. *Social Science and Medicine*, *64*, 77-94. doi:10.1016/j.socscimed.2006.08.031

Markland, D. & Tobin, V. J. (2010). Need support and behavioural regulations for exercise among exercise referral scheme clients: The mediating role of psychological need satisfaction. *Psychology of Sport and Exercise, 11*, 91-99. doi:10.1016/j.psychsport.2009.07.001

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 60*(1), 48–58. doi:10.1080/02701367.1989.10607413

McAuley, E., Jerome, G. J., Elavsky, S., Marquez, D. X., & Ramsey, S. N. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine, 37*, 110-118. doi:10.1016/S0091-7435(03)00089-6

McDonough, M. H. & Crocker, P. R. E. (2007). Testing self-determined motivation as a mediator of the relationship between psychological needs and affective and behavioral outcomes. *Journal of Sport & Exercise Psychology, 29*(5), 645-663.

Melzer, K., Kayser, B., & Pichard, C. (2004). Physical activity: The health benefits outweight the risks. *Current Opinions in Clinical Nutrition and Metabolic Care, 7,* 641-647.

Mensink, G. B. M. (2002). Bundes-Gesundheitssurvey: Körperliche Aktivität. Aktive Freizeitgestaltung in Deutschland [Federal health survey: Physical activity. Active leisure time in Germany]. In Robert Koch-Institut (Ed.), *Beiträge zur Gesundheitsberichterstattung des Bundes.* Berlin, Deutschland: Robert Koch-Institut.

Molloy, G. J., Dixon, D., Hamer, M., & Sniehotta, F. F. (2010). Social support and regular physical activity: Does planning mediate this link? *British Journal of Health Psychology, 15*, 859-870. doi:10.1348/135910710X490406

Möller, J. (1999). Sport im Alter – Auswirkungen von Sport auf die Gesundheit Erwachsener ab 50 Jahren: Eine Metaanalyse [Physical activity in old age – health implications for adults over 50 years : a meta-analysis]. *Sportwissenschaft, 29,* 440–454.

Moosbrugger, H & Kelava, A. (2007). *Testtheorie und Fragebogenkonstruktion* [Test theory and measurement construction]. Berlin, Germany: Springer.

Murray, H. A. (1938). *Explorations in personality*. New York, NY, USA: Oxford University Press.

Muthén, L. K., & Muthén, B. O. (2010). *Mplus. User's Guide* (6th Ed.). Los Angeles, CA, USA: Muthén & Muthén.

Netzwerk Gesundheit und Bewegung Schweiz (2007). *Gesundheitswirksame Bewegung*. Magglingen: Bundesamt für Sport BASPO. Retrieved from [06.11.2010]: http://www.hepa.ch/internet/hepa/de/home/dokumentation/grundlagendokumente.parsys.74026.downloadList.77540.DownloadFile.tmp/bewegungsempferw20074hepa.pdf

Niemiec, C. P., Lynch, M. F., Vansteenkiste, M., Bernstein, J., Deci, E. L., & Ryan, R. M. (2006). The antecedents and consequences of autonomous self-regulation for college: a self-determination theory perspective on socialization. *Journal of Adolescence, 29*, 761-775. doi:10.1016/j.adolescence.2005.11.009

Ng, J. Y. Y., Ntoumanis, N., Thørgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L. & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7,* 325-340. doi:10.1177/1745691612447309

Oguma, Y. & Shinoda-Tagawa, T. (2004). Physical activity decreases cardiovascular disease risk in women: review and meta-analysis. *American Journal of Preventive Medicine, 26*, 407-418. doi:10.1016/j.amepre.2004.02.007

Oka, R. K., King, A. C., & Young, D. R. (1995). Sources of social support as predictors of exercise adherence in women and men ages 50 to 65 years. *Women's Health, 1*(2), 161-175.

Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. London, England: Pinter Publishers Limited.

Paffenbarger, R. S., Hyde, R. T., Wing, A. L., Lee, I. M., Jung, D. L., & Kampert, J. B. (1993). The association of changes in physical-activity level and other lifestyle characteristics without mortality among men. *New England Journal of Medicine, 328,* 338–335. doi:10.1056/NEJM199302253280804

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., Buchner, D., Ettinger, W., Heath, G. W., King, A. C. et al. (1995). Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *The Journal of the American Medical Association, 273*, 402-407.

Pettee, K.K., Brach, J.S., Kriska, A.M., Boudreau, R., Richardson, C.R., Colbert, L.H., Satterfield, S., Visser, M., Harris, T. B., Ayonayon, H. N. & Newman, A.B. (2006). Influence of marital status on physical activity levels among older adults. *Medicine & Science in Sports & Exercise, 38,* 541-546. doi:10.1249/01.mss.0000191346.95244.f7

Prestwich, A, Conner, M., Lawton, R. Bailey, W., Litman, J., & Molyneaux, V. (2005). Individual and collaborative implementation intentions and the promotion of breast self-examination. Psychologiy & Health, 20, 743-760. doi:10.1080/14768320500183335

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). Rochester NY, USA: University of Rochester Press.

Reis, H. T., Sheldon K. M., Gable, S, L., Roscoe, J., & Ryan R. M. (2000). Daily Well-Being: The Role of Autonomy, Competence, and Relatedness. *Personality and Social Psychology Bulletin, 26*, 419-435. doi:10.1177/0146167200266002

Rheinberg, F. (2004). *Motivationsdiagnostik [Diagnostics of Motivation]*. Göttingen, Germany: Hogrefe.

Rheinberg, F., Vollmeyer, R., & Engeser, S. (2003). Die Erfassung des Flow-Erlebens [The measurement of Flow-Experience]. In J. Stiensmeier-Pelster & F. Rheinberg (Eds.), *Diagnostik von Motivation und Selbstkonzept* (p.261-279). Göttingen, Germany: Hogrefe.

Russell, K. L. & Bray, S. R. (2009). Self-determined motivation predicts independent, home-based exercise following cardiac rehabilitation. *Rehabilitation Psychology, 54*, 150-156. doi:10.1037/a0015595

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63*, 397-427. doi:10.1111/j.1467-6494.1995.tb00501.x

Ryan, R. M. & Deci, E. L. (2004). Overview of self-determination theory: An organismic-dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp.3 - 33). Rochester, NY: The University of Rochester Press.

Ryan, R. M., & Deci, E. L. (2007). Active human nature. Self-determination theory and the promotion and maintenance of sport, exercise, and health. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 1–20). Champaign, IL, USA: Human Kinetics.

Ryan, R. M., Deci, E. L., & Grolnick, W. S. (1995). Autonomy, relatedness, and the self: Their relation to development and psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Theory and methods* (pp. 618–655). New York, NY, USA: Wiley.

Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology, 28*(4), 335-354.

Ryan, R. M., & Solky, J. A. (1996). What is supportive about social support? On the psychological needs for autonomy and relatedness. In G. R. Pierce, B. R. Sarason, & J. G. Sarason (Eds.), *Handbook of social support and the family* (pp. 249–267). New York, NY, USA: Plenum Press.

Ryan, R., Williams, G., Patrick, H., & Deci, E. (2009). Self-determination theory and physical activity: the dynamics of motivation in development and wellness. *Hellenic Journal of Psychology, 6*(2), 107-124

Sallis, J.F., Alcaraz, J.E., McKenzie, T.L., Hovell, M.F. (1999). Predictors of change in children's physical activity over 20 months. *American Journal of Preventive Medicine, 16,* 222-229. doi:10.1016/S0749-3797(98)00154-8

Schafer, J. L. & Graham, J. W. (2002). Missing Data: Our view of the state of the art. *Psychological Methods, 7*, 147-177. doi:10.1037//1082-989X.7.2.147

Schallberger, U. (2005). *Kurzskala zur Erfassung der Positiven Aktivierung, Negativen Aktivierung und Valenz in Experience Sampling Studien (PANAVA-KS) [Short scales for the assessment of positive affect, negative affect, and valence in experience sampling studies]*. Unpublished manuscript, Department of Psychology, University of Zurich, Switzerland.

Schweizer, K. (2010). The adaptation of assessment instruments to the various European languages. *European Journal of Psychological Assessment, 26*, 75-76. doi:10.1027/1015-5759/a000011

Scholz, U., Nagy, G., Schüz, B., & Ziegelmann, J. P. (2008). The role of motivational and volitional factors for self-regulated running training: Associations on the between- and

within- person level. *British Journal of Social Psychology, 47*, 421-439. doi:10.1348/014466607X266606

Scholz, U., Schüz, B. Ziegelmann, J. P., Lippke, S. & Schwarzer, R. (2008). Beyond behavioural intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology, 13*, 479-494. doi:10.1348/135910707X216062

Scholz, U., Sniehotta, F.F., & Schwarzer, R. (2005). Predicting physical exercise in cardiac rehabilitation: The role of phase-specific self-efficacy beliefs. *Exercise Psychology, 27*(2), 135-151.

Schubert, I., Horch, K., Kahl, H., Köster, I., Meyer, C., & Reiter, S. (2004). *Gesundheit von Kindern und Jugendlichen [Physical health of children and youths]*. Berlin, Germany: Robert Koch Institut.

Schulz, U., & Schwarzer, R. (2003). Soziale Unterstützung bei der Krankheitsbewältigung: Die Berliner Social Support Skalen (BSSS) [Social support and coping with illness: The Berlin Social Support scales (BSSS)]. *Diagnostica, 49,* 73-82. doi:10.1026//0012-1924.49.2.73

Schwarzer, R. (2004). *Psychologie des Gesundheitsverhaltens. Einführung in die Gesundheitspsychologie [Psychology of health behavior. An introduction to health psychology]*. Göttingen, Germany: Hogrefe.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology, 57*, 1-29. doi:10.1111/j.1464-0597.2007.00325.x

Schwarzer, R., & Fuchs, R. (1995). Changing risk behaviors and adopting health behaviors: The role of self-efficacy beliefs. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 259–288). New York, NY, USA: Cambridge University Press.

Schwarzer, R. & Knoll, N. (2007). Functional roles of social support within the stress and coping process: A theoretical and empirical overview. *International Journal of Psychology, 42*, 243-252. doi:10.1080/00207590701396641

Schwarzer, R., & Knoll, N. (2010). Social support. In A. Kaptein & J. Weinman (Eds.), *Health psychology* (2nd Ed., 283-293). Oxford, England: Blackwell.

Schwarzer, R., Luszczynska, A., Ziegelmann, J.P., Scholz, U., & Lippke, S. (2008). Social-cognitive predictors of physical exercise adherence: Three longitudinal studies in rehabilitation. *Health Psychology, 27*, (Suppl.), S54-S63. doi:10.1037/0278-6133.27.1(Suppl.).S54

Seelig, H. & Fuchs, R. (2006). Messung der sport- und bewegungsbezogenen Selbstkonkordanz [Measurement of exercise related self-concordance]. *Zeitschrift für Sportpsychologie, 13*, 121-139. doi:10.1026/1612-5010.13.4.121

Sheeran, P. (2002). Intention-behavior relations: A conceptual and empirical review. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. 12, pp. 1–36). Chichester, England: Wiley.

Sigal, R. J., Kenny, G. P., Wasserman, D. H., & Castaneda-Sceppa, C. (2004). Physical activity/exercise and type 2 diabetes. *Diabetes Care, 27*(10), 2518–2539. doi:10.2337/diacare.27.10.2518

Silva, M. N., Markland, D., Vieira, P. N., Coutinho, S. R., Carraça, E. V., Palmeira, A. L., ... Teixeira, P. J. (2010). Helping overweight women become more active: Need support and motivational regulations for different forms of physical activity. *Psychology of Sport and Exercise, 11*, 591-601. doi:10.1016/j.psychsport.2010.06.011

Sime, W. E. (1987). Exercise in the prevention and treatment of depression. In W. P. Morgan & S. E. Goldston (Eds.), *Exercise and mental health* (pp. 145–152). Washington, DC, USA: Hemisphere.

Sniehotta, F. F., Nagy, G., Scholz, U., & Schwarzer, R. (2006). Action control during the first

weeks of health behaviour change: A longitudinal study with CHD patients. *British Journal of Social Psychology, 45,* 87–106.

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2006). Action plans and coping plans for physical exercise: A longitudinal intervention study in cardiac rehabilitation. *British Journal of Health Psychology, 11*, 23-37. doi:10.1348/135910705X43804

Spanier, P. A., & Allison, K. R. (2001). General social support and physical activity: An analysis of the Ontario Health Survey. *Canadian Journal of Public Health, 92*(3), 210-213.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). Predicting motivational regulations in physical education: The interplay between dispositional goal orientations motivational, climate and perceived competence. *Journal of Sports Sciences, 21*, 631-647. doi:10.1080/0264041031000101962

Suva (2012). Wagnisse – Gefährliche Sportarten [Ventures – risky sport] [Website]. Retrieved December 10, 2012 from http://www.suva.ch/startseite-suva/praevention-suva/sichere-freizeit-suva/wagnisse-suva.htm

SPSS (Statistical Package for the Social Sciences, 2009). *SPSS Missing Values 17.0.* Chicago, IL: SPSS Inc.

Stadt Zürich, Schul- und Sportdepartement (2013). Sportpartner-Börse http://www.stadt-zuerich.ch/content/ssd/de/index/sport/sportpartner_suchen.html (02.01.2013)

The IPAQ Group (2005). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ). Retrieved June, 27 2012, from http://www.ipaq.ki.se/scoring.pdf

Trost, S. G., Owen, N., Bauman, A. E., Sallis, J. F., & Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine and Science in Sports and Exercise, 34,* 1996–2001. doi:10.1249/01.MSS.0000038974.76900.92

Uchino, B. N. (2009). Understanding the links between social support and physical health: A life-span perspective with emphasis on the separability of perceived and received support. *Perspectives on Psychological Science, 4*, 236–255. doi:10.1111/j.1745-6924.2009.01122.x

Uchino, B. N., Uno, D., & Holt-Lunstad, J., (1999). Social support, physiological processes, and, health. *Current Directions in Psychological Science, 8,* 145-148. doi:10.1111/1467-8721.00034

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*(3), 306–319. doi:10.2307/2136848

van Stralen, M. M., De Vries, H., Mudde, A. N., Bolman, C.& Lechner, L. (2009). Determinates of initiation and maintenance of physical activity among older adults: a literature review. *Health Psychology Review, 3*, 147-207. doi:10.1080/17437190903229462

Vlachopoulos, S.P., Kaperoni, M., & Moustaka, F. C. (2011). The relationship of self-determination theory variables to exercise identity. *Psychology of Sport and Exercise, 12*, 265-272. doi:10.1016/j.psychsport.2010.11.006

Vlachopoulos, S. P. & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise. *Measurement in Physical Education and Exercise Science, 10*, 179-201. doi:10.1207/s15327841mpee1003_4

Vögele, C. (2003). Sport und Bewegung als Behandlungsansatz [Sport and exercise as treatment approach]. In F. Petermann & V. Pudel (Eds.), *Adipositas* (pp. 283–302). Göttingen, Germany: Hogrefe.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of a brief measure of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070. doi:10.1037/0022-3514.54.6.1063

Weinstein, N. D. (2003). Exploring the links between risk perceptions and preventive health behaviour. In J. Suls & K. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 22–53). Oxford, England: Blackwell.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables. Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling. Concepts, issues, and applications* (pp. 56–75). Thousand Oaks, CA, USA: Sage.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*(5), 297–333. doi:10.1037/h0040934

Williams, G. C. (2002). Improving patients' health through supporting the autonomy of patients and providers. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 233–254). Rochester, NY, USA: University of Rochester Press.

Wilson, P. M. & Rodgers, W. M (2004). The relationship between perceived autonomy support, exercise regulations and behavioural intentions in women. *Psychology of Sport and Exercise, 5*, 229-242. doi:10.1016/S1469-0292(03)00003-7

Wilson, P. M., Rodgers, W., M., Blanchard, C. M. & Gessell, J. (2003).The relationship between psychological needs, self-determined motivation, exercise attitudes, and physical fitness. *Journal of Applied Social Psychology, 33,* 2373–2392. doi:10.1111/j.1559-1816.2003.tb01890.x

Wilson, P. M., Rodgers, W. M, & Fraser, S. N. (2002). Examining the psychometric properties of the behavioural regulation in exercise questionnaire. *Measurement in Physical Education & Exercise Science, 6*, 1-21. doi:10.1207/S15327841MPEE0601_1

Wilson, P. M., Rogers, W. T, Rodgers, W. M., & Wild, T. C. (2006). The psychological need satisfaction in exercise scale. *Journal of Sport and Exercise Psychology, 28*(3), 231-251.

World Health Organization [WHO] (2002). *The World Health Report 2002. Reducing risk, promoting healthy life.* Geneva, Switzerland: World Health Organization.

World Health Organization [WHO] (2010). *Global recommendations on physical activity for health*. Geneva, Switzerland: World Health Organization.

World Health Organization [WHO] (2012, 12, 10). What is moderate-intensity and vigorous-intensity physical activity? [Website]. Retrieved from http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/index.html

Appendix

Appendix A German scale for the assessment of received social support

Appendix B German scale for the assessment of need satisfaction of autonomy, competence, and relatedness in exercise (PNSEG)

Note. Only those questionnaires that were self-developed or adapted were included in the appendix. For all other questionnaires used in the studies it is referred to the reference included in the measures sections above.

Appendix A

German scale for the assessment of received social support (adapted to the context of physical exercise from Berlin Social Support Scale, Schulz & Schwarzer, 2003).

*Received **emotional** social support*

1. Diese *Person* hat mir gezeigt, dass sie mein Sportverhalten akzeptiert
2. Diese *Person* hat mich getröstet, wenn ich nicht so Sport treiben konnte, wie ich wollte.
3. Diese *Person* hat mir gezeigt, dass sie hinter meinem Sportverhalten steht
4. Diese *Person* hat mir gezeigt, dass sie für mein Sportverhalten Verständnis hat
5. Diese *Person* war für mich da, wenn ich über mein Sportverhalten reden wollte

*Received **instrumental** social support*

6. Diese *Person* hat mir geholfen, mein Sportverhalten noch zu verbessern
7. Diese *Person* hat mich darin unterstützt, regelmässig sportlich aktiv zu sein
8. Diese *Person* hat mich darin unterstützt mein Sportverhalten aufrechtzuerhalten
9. Diese *Person* hat mir ihre Hilfe angeboten, damit ich mein Sportverhalten besser einhalten kann
10. Diese *Person* hat mir angeboten, mit ihr gemeinsam Sport zu machen.
11. Diese *Person* hat mir ihre Hilfe angeboten, damit ich so sportlich aktiv sein kann, wie ich will
12. Diese *Person* hat mich dazu ermutigt Sport zu treiben

*Received **informational** social support*

13. Diese *Person* hat mir Informationen zum Sport Treiben besorgt
14. Diese *Person* hat mir verschiedene Möglichkeiten gezeigt, wie ich Sport treiben kann.
15. Diese *Person* hat mir hilfreiche Tipps für meine sportliche Aktivität gegeben

Antwortformat: 1 = stimmt gar nicht bis 6 = stimmt genau

Appendix B

German scale for the assessment of need satisfaction of autonomy, competence, and relatedness in exercise (PNSEG) (referred to Deci and Ryan).

„Die folgenden Aussagen beziehen sich auf die Situation, in der Sie sportlich aktiv sind. Bitte geben Sie an, in welchem Ausmass diese Aussagen jeweils auf Sie ganz persönlich zutreffen."

Autonomie

- Ich bin überzeugt, dass die Art wie ich trainiere ein Ausdruck meiner Selbst ist.
- Ich habe viele Möglichkeiten auf die Art und Weise meines Trainings einzuwirken.
- Mein Trainingsprogramm passt sehr gut zu meinen Interessen und zu dem was mir wichtig ist.

Kompetenz

- Ich vertraue auf meine Fähigkeit, das Training regelmässig zu besuchen.
- Ich bin den Anforderungen meines Trainingsprogramms gewachsen.
- Ich habe den Eindruck, dass ich die Übungen meines Trainingsprogramms sehr effektiv ausführe.
- Ich bin auf einem guten Weg meine Trainingsziele zu erreichen.

Soziale Eingebundenheit

- Ich fühle mich mit den Personen verbunden, zu denen ich Kontakt habe während ich trainiere.
- Im Umgang mit den anderen Trainierenden fühle ich mich sehr ungezwungen.
- Ich habe ein freundschaftliches Verhältnis zu den anderen Trainierenden, weil wir aus den gleichen Gründen trainieren.
- Ich fühle mich sehr wohl, wenn ich mit den anderen Trainierenden zusammen bin.

Antwortformat: 1 – „trifft gar nicht zu" bis 7 – „trifft voll und ganz zu"

Curriculum Vitae von Pamela Rackow

Dienstadresse Psychologisches Institut,
Sozial- und Gesundheitspsychologie
Universität Zürich
Binzmühlestrasse 14/ Box 14
8050 Zürich, Schweiz
E-Mail: pamela.rackow@psychologie.uzh.ch
Telefon: 0041 44 635 72 59

Geburtsdatum/ -ort: 06. Oktober 1979 in Seesen (D)
Familienstand: Ledig
Nationalität: Deutsch

Studium

10/2001-03/2008	Studium der Psychologie und Sonderpädagogik an der Carl von Ossietzky Universität Oldenburg (D) Studienabschluss Diplom -Psychologin (sehr gut)
10/1999-09/2001	Studium der Sozialwissenschaften, Englisch und Geschichte an der Universität Göttingen

Berufliche Tätigkeiten

seit 02/2009	Lehrbeauftragte der Philosophischen Fakultät der Universität Zürich
seit 10/2008	Assistentin und Doktorandin an der Universität Zürich, Psychologisches Institut (Sozial- und Gesundheitspsychologie)
04/2008 – 08/2008	Wissenschaftliche Mitarbeitern und Lehrbeauftragte an der Universität der Künste, Berlin (D)
12/2006 – 03/2008	Studentische Hilfskraft im Institut für Umwelt und Kultur der Carl von Ossietzky Universität Oldenburg (D)
07/2006 – 12/2006	Studentische Hilfskraft im Dekanat der Fakultät IV der Carl von Ossietzky Universität Oldenburg (D) (Studiendekan Dr. Mehl)

Forschungsaufenthalte

Juni 2012	Newcastle Health Psychology Research Group an der Newcastle University (Institute of Health and Society) bei Dr. Falko Sniehotta

Publikationen und Kongressbeiträge

Rackow, P., Scholz, U., & Hornung, R (in press). The German Psychological Needs in Exercise Scale –Validation of a Measure of Need-satisfaction in Exercise. *Swiss Journal of Psychology.*

Rackow, P., Scholz, U., & Hornung, R (eingereicht). *Promoting received social support and physical exercising: An intervention study to test the enabling hypothesis.*

Rackow, P., Scholz, U, Sniehotta, F., & Hornung, R (eingereicht). *Effects of an exercise companion on physical exercise: An intervention study*.

Rackow, P. Scholz, U., & Hornung, R. (2012, September). *Die Rolle sozialer Unterstützung für Selbstwirksamkeit, Planung und Handlungskontrolle im HAPA Modell.* In S. Burkert (chair), *Arbeitsgruppe: Die Rolle sozialer Austauschprozesse für Gesundheit und Wohlbefinden.* Vortrag bei dem 48. Kongress der Deutschen Gesellschaft für Psychologie, Bielefeld, Deutschland.

Rackow, P. Scholz, U., & Hornung, R. (2012, August). *Promoting social support and health behaviour: An intervention study to test the enabling hypothesis.* In U. Scholz & N. Knoll (Chair), *Symposium 30: Social exchange processes and health: new findings and future directions.* Vortrag an der 26th Annual Conference of the European Health Psychology Society (EHPS), Prag, Tschechische Republik.

Radtke, T.**,** Rackow, P., & Hornung, R. (2012, August). *Take the stairs instead of the elevator: An investigation based on psychological constructs*. Poster bei der 26th Annual Conference of the European Health Psychology Society (EHPS), Prag, Tschechische Republik.

Rackow, P., Scholz, U., & Hornung, R. (2012, Juli). *Which type of social support is the best for promoting self-efficacy and exercise behaviour? Emotional social support wins the run!* In N. Knoll & U. Scholz (Chair), *Symposium 2: Helping to help myself? When autonomy and self-efficacy meet support and control.* Symposiumsvortrag auf der 33rd STAR (Stress and Anxiety Research Society) Conference, Palma de Mallorca, Spanien.

Rackow, P., Scholz, U., & Hornung, R. (2011, September). *The role of social support for self-efficacy and exercise behaviour.* Poster session bei der 25th Annual Conference of the European Health Psychology Society (EHPS), Kreta, Griechenland.

Rackow, P., Scholz, U., & Hornung, R. (2011, August). *Die Rolle sozialer Unterstützung für die Selbstwirksamkeit bei sportlicher Aktivität.* Vortrag am 10. Kongress für Gesundheitspsychologie, Berlin, Deutschland.

Rackow, P., Scholz, U., & Hornung, R (2011, Juli). *Need Satisfaction in Exercise: Validation of a German measure of autonomy, competence and social relatedness in exercise*. Poster bei dem 12th European Congress of Psychology, Istanbul, Türkei.

Rackow, P., Scholz, U., & Hornung, R (2010, September). *Konstruktion und Valdierung der Skala Bedürfnisse im Sport.* Poster bei dem 47. Kongress der Deutschen Gesellschaft für Psychologie, Bremen, Deutschland.

Rackow, P., Scholz, U., & Hornung, R (2010, August). *Need Satisfaction in Exercise: Validation of a German measure of autonomy, competence and social relatedness in exercise*. Vortrag bei der 24th European Health Psychology Conference, Cluj-Napoca, Rumänien.

Rackow, P., Scholz, U., & Hornung, R (2010, Mai). *The role of autonomous motivation, autonomy support and intention for smoking behavior.* Poster bei der 4th International SDT Conference, Gent, Belgien.

Rackow, P. (2009, Juli). *Are Deci & Ryan's basic needs assumptions adoptable to recreational environments.* Poster bei 11th European Congress of Psychology, Oslo, Norwegen.

Rackow, P. (2008, August). *Visitors' Need Satisfaction in Three Different Museums*. In H. Höge (Chair), *Symposium V: Muselogy.* Symposiumsvortrag auf dem 20th Congress of the International Association of Empirical Aesthetics, Chicago, USA.

Rackow, P. (2008, Mai). *Towards need-structure of museum visitors. An empirical comparison of three kinds of museums.* Vortrag am Symposium „Understanding Museums", Berlin, Deutschland.

Forschungsprojekte

seit 2011	„Nimm` doch mal wieder d`Stäge" – **B**ewegung **U**nd **T**reppe (BUT) Projektleitung: Pamela Rackow und Theda Radtke
seit 2010	„Das Zusammenspiel erhaltener sozialer Unterstützung mit der Befriedigung dreier psychologischer Grundbedürfnisse und sportlicher Aktivität"; Projektleitung: Pamela Rackow

2008-2010	Übersetzung und Validierung der “German Psychological Need Satisfaction in Exercise Scale”; Projektleitung: Pamela Rackow

Akademische Auszeichnungen und Drittmittel

11/2011	Zuspruch eines Auslands-Kurz-Mentorat der UZH (Ausschreibung Fakultäres Mentoring II 2012) (1500,00 CHF)
08/2009	Kostenübernahme der Teilnahme an der „Fourth Summer School in Methods and Techniques“ des European Consortium for Political Research (ECPR) durch den Schweizerischen Nationalfond (2170,00 CHF)
07/2008	"Beste Abschlussarbeit im Fach Psychologie" verliehen durch die Fakultät V der Carl von Ossietzky Universität Oldenburg (D)

Mitarbeit in universitären und ausseruniversitären Gremien

seit 2012	National Representative for Switzerland in der Stress and Anxiety Research Society (STAR)
seit 2011	Mitorganisation des Forschungskolloquiums des akademischen Mittelbaus des Psychologischen Instituts der Universität Zürich
seit 2011	Mitglied des Organisationskomitees (application master) von CREATE (Collaborative Research And Training in the EHPS) als Teil der European Health Psychology Society (EHPS)
seit 2011	Mitglied der Peer Mentoring Gruppe „Methoden und Statistik“ am Psychologischen Institut der Universität Zürich
seit 2010	Vertreterin des akademischen Mittelbaus in der Besetzungskommission der Professur Angewandte Sozialpsychologie des Psychologischen Instituts der Universität Zürich
FS 2010 & HS 2012	Organisation des Gästekolloquiums des Masterschwerpunktes „Sozial-, Organisations- und Wirtschaftspsychologie“ des Psychologischen Instituts der Universität Zürich

Kongressorganisation

09/2009	Mithilfe bei der Organisation und Durchführung des 8. Umweltpsychologiekongress in Zürich. (Ausgerichtet durch die Fachgruppe Sozialpsychologie, Universität Zürich)
05/2009-08/2009	Mitorganisation des 9. Kongress für Gesundheitspsychologie an der Universität Zürich (Ausgerichtet durch die Fachgruppe Sozial- und Gesundheitspsychologie, Universität Zürich)

Professionelle Anbindungen

European Health Psychology Society (EHPS)
CREATE: Collaborative Research and Training in the EHPS
Stress and Anxiety Research Society (STAR)
International Association of Empirical Aesthetics (IAEA)

Ad hoc Reviewer

Anxiety, Stress and Coping; Applied Psychology: Health and Well-Being

Lehrtätigkeit

Universität Zürich (CH)

Praktische Intervention: *Gestalten und Evaluieren von Interventionsplakaten* (Herbstsemester (HS) 2012)

Praktische Intervention: *Entwicklung und Durchführung eines Selbstwirksamkeitstrainings für Jugendliche* (HS 2011)

Praktische Intervention: *Mehr Bewegung! Durch Treppensteigen?* (Frühjahrssemester (FS) 2011)

Theoretische und präventive Grundlagen der Gesundheitspsychologie) (HS 2010)

Psychologische Grundkompetenzen (HS 2010)

Gesundheitliches Risikoverhalten und soziale Unterstützung (HS 2009)

Projektgruppe: *Soziale Unterstützung und Gesundheitsverhalten* (seit FS 2009)

Forschungskolloquium der Fachgruppe Sozial- und Gesundheitspsychologie (seit HS 2008)

Workshop: *Verfassen eines wissenschaftlichen Berichtes* (seit HS 2008)

Universität der Künste, Berlin (D)

Kommunikationspsychologie (Sommersemester 2008)

Carl von Ossietzky Universität, Oldenburg (D)

Tutorin im *Modul Psychologie* des Studienganges Lehramt (BA) bei Pof. Viebahn (Sommersemester 2006)

Tutorin in der Veranstaltung *Experimentalpraktikum* der Psychologie bei Prof. Höge (Wintersemester 2003/2004 und 2004/2005)